

**RECORDS AND OBSERVATIONS FROM
PLANKTON GRID STUDIES OFF BAJA
CALIFORNIA, APRIL 1952**



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RECORDS AND OBSERVATIONS FROM PLANKTON GRID STUDIES OFF BAJA CALIFORNIA, APRIL 1952

by
David Kramer



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CONTENTS

| | Page |
|------------------------------|------|
| Introduction. | 1 |
| Survey design. | 2 |
| Methods of sampling. | 2 |
| Sardine eggs | 2 |
| Fish larvae. | 11 |
| Plankton volumes. | 21 |
| Literature cited. | 42 |

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by

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ABSTRACT

Data are presented for a grid survey conducted for 5 days in April 1952. The cruise was made by three vessels; one made a daily survey of a square grid of 25 stations spaced 4 miles apart, one maintained an anchor station on this pattern, and one followed a 10-meter drogue drifting through the pattern.

The data deal with the eggs and larvae of the Pacific sardine (*Sardinops caerulea*) and the larvae of other commercial species; the northern anchovy (*Engraulis mordax*), the jack mackerel (*Trachurus symmetricus*), the Pacific mackerel (*Pneumatophorus diego*), the hake (*Merluccius productus*), and rockfish (*Sebastes* spp.). All the above larvae except those of the hake and rockfish are reported by size. Data are also included for the larvae of a deep-sea smelt *Leuroglossus stilbius*, and a lanternfish *Lampanyctus mexicanus*, because of their abundance on this survey. Distribution diagrams show the more abundant fish larvae and plankton volumes on the grids. Plankton volumes are reported and differences in day and night collections are discussed.

Introduction

This paper reports on the data gathered on a special cruise made in April 1952. The work was designed to investigate some of the problems encountered in the sampling techniques of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) in monthly surveys off the Pacific coast of the United States and Baja, California.

The CalCOFI are sponsored by the California Marine Research Committee. The co-operating agencies in these investigations are the U.S. Bureau of Commercial Fisheries, the Scripps Institution of Oceanography, the California Department of Fish and Game,

Hopkins Marine Station of Stanford University and the California Academy of Sciences.

The data are presented in figures and tables in the same manner as the data reported by the Bureau of Commercial Fisheries Biological Laboratory at La Jolla, Calif., on the sardine eggs and larvae and other fish larvae for 1950-57 (Ahlstrom, 1952, 1953, 1954a, 1958, 1959; Ahlstrom and Kramer, 1955, 1956, 1957). The fish larvae reported for this cruise include the following commercial species: Pacific sardine (*Sardinops caerulea*), northern anchovy (*Engraulis mordax*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel *Pneumatophorus diego*, hake (*Merluccius productus*), and rockfish (*Sebastes* spp.). Two other species are included because of their

abundance during this survey; a deep-sea smelt (*Leuroglossus stilbius*) and a lanternfish (*Lampanyctus mexicanus*). The report also records the plankton volumes at all the stations on the survey. Plankton volumes are reported annually by this laboratory (Staff, South Pacific Fishery Investigations, 1952 through 1956; Thraillkill, 1957, 1959, 1961); but the plankton data for this special cruise have not been reported previously.

SURVEY DESIGN

The survey was designed with the following objectives: First, to determine short-period (1-day) time changes in distribution and numbers of planktonic organisms, particularly sardine eggs and larvae. A close-spaced grid (gridiron) in a 16-mile square of 25 "grid stations" (stations 4 miles apart) was established south of Punta Eugenia, Baja California (fig. 1).¹ This square represented a statistical area of 400 square miles (20 miles to a side), one-fourth of that assigned to a station (stations 40 miles apart) on the regular CalCOFI pattern. Second, to observe the hydrographic and biological changes at a fixed point. An "anchor station" marked by a fixed buoy was placed at grid-station 3, which is also the regular CalCOFI station 123.40. Third, to observe a single water mass, its movements and its constituents. A "drogue station" was established with a 10-meter drogue attached to a buoy. Its position was determined by currents at that level, and observations at times designated for stations were made at the buoy wherever it was found.

METHODS OF SAMPLING

The survey was made April 18-23 by the research vessels the *Black Douglas* of the Bureau of Commercial Fisheries and the *Crest* and *Horizon* of the Scripps Institution of Oceanography. The *Black Douglas* and the *Crest* alternated on the grid pattern and anchor station, the former covering the pattern on the first, third, and fifth days. The *Horizon* sampled at

¹ The grid location was determined by two consecutive surveys of the CalCOFI pattern off central Baja California during late March and early April. Final observations on the last cruise were taken only 2 days before the survey began.

the drogue stations for the full time of the investigation.

Hydrographic and biological observations and collections followed the standard procedure of the CalCOFI cruises (Ahlstrom, 1952). At grid stations these included one 200-meter net tow for plankton, one 10-meter hydrographic cast for temperature and salinity, one 900-foot bathythermograph (BT) cast, and observations of meteorological data. Drogue and anchor stations were made every 4 hours. These observations and collections were the same as those of the grid stations, but with standard hydrographic casts to 600 meters. Additional data from the drogue stations included bacteriological samples collected with Johnson-ZoBell (J-Z) bottles on the hydrographic casts. The drogue ship also conducted current observations (GEK) in the intervals between stations. Station data are shown in table 1.

The 25 stations on the grid covered on the first day will be referred to as Grid I (GI-1 to GI-25), those of the next day, Grid II (GII-1 to GII-25), etc., for a total of 125 stations during the 5-day survey. During the same period, 30 drogue stations (D-1 to D-30) and 30 anchor stations (A-1 to A-30) were occupied.

The 10-meter drogue drifted in a southerly current for about 75 nautical miles from its northernmost station, D-2 (fig. 1).

The anchor-station buoy broke loose after the first six observations. This station was then maintained by navigation, placing most of the following observations within 2 or 3 miles of the original position. An error in navigation placed the last six stations about 7 miles south of the original position (table 1).

SARDINE EGGS

Sardine eggs, listed by age in days (as described by Ahlstrom, 1943), are reported as numbers of normal eggs and total number of eggs (table 2). The totals in excess of the numbers of normal eggs include abnormal eggs that had stunted, discolored, and misshapen embryos. Unclassified eggs are those too deteriorated for aging.

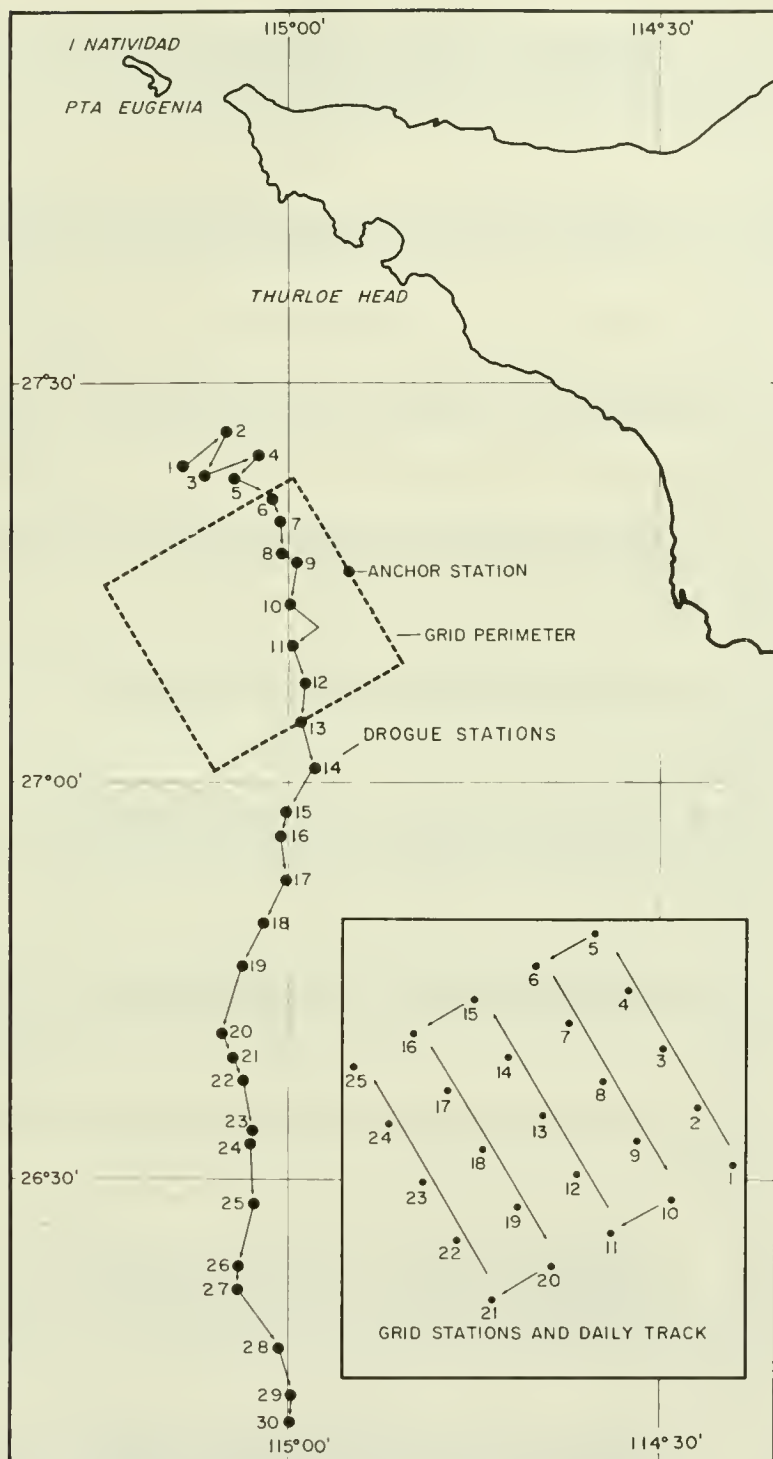


Figure 1. Drogue trajectory and stations, grid perimeter and anchor station covered on three-ship survey, April 18-23, 1952.
 Insert:--stations and track followed on grid coverage.

Table 1.--Station data: grid studies, April 1952

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1,000 m. ³ | | Standard haul factor |
|--------------|-------------|--------------|-------|--------------------------|---------------------|-----------------------|---------------|-------------------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | Total | Small organisms only | |
| <i>Droge</i> | | | April | PST | Minutes and seconds | m. | m. | ml. | ml. | |
| D-1 | 27°23.8' | 115°03.4' | 18 | 1005 | 15'09" | 504 | 136 | 26 | 26 | 2.70 |
| D-2 | 27°26.4' | 115°05.1' | 18 | 1210 | 14'32" | 435 | 140 | 30 | 30 | 3.21 |
| D-3 | 27°23' | 115°06.8' | 18 | 1615 | 14'45" | 539 | 140 | 48 | 48 | 2.60 |
| D-4 | 27°24' | 115°02.3' | 18 | 2005 | 14'39" | 568 | 124 | 60 | 60 | 2.18 |
| D-5 | 27°23' | 115°04.1' | 19 | 0010 | 14'41" | 475 | 141 | 67 | 67 | 2.97 |
| D-6 | 27°21.5' | 115°01' | 19 | 0415 | 14'47" | 497 | 143 | 84 | 84 | 2.88 |
| D-7 | 27°19.5' | 115°00.7' | 19 | 0810 | 14'39" | 508 | 140 | 49 | 49 | 2.76 |
| D-8 | 27°17' | 115°00.8' | 19 | 1210 | 14'34" | 464 | 146 | 47 | 47 | 3.15 |
| D-9 | 27°16.5' | 114°59' | 19 | 1615 | 14'41" | 494 | 134 | 42 | 42 | 2.72 |
| D-10 | 27°13.4' | 114°59.7' | 19 | 2015 | 14'54" | 476 | 141 | 88 | 88 | 2.96 |
| D-11 | 27°10.6' | 114°59.3' | 20 | 0235 | 15'13" | 481 | 132 | 67 | 67 | 2.74 |
| D-12 | No sample | | | | | | | | | |
| D-13 | 27°04.6' | 114°59.2' | 20 | 0810 | 14'49" | 458 | 146 | 52 | 52 | 3.18 |
| D-14 | 27°01.5' | 114°57.9' | 20 | 1215 | 14'39" | 441 | 145 | 50 | 50 | 3.28 |
| D-15 | 26°57.8' | 115°00' | 20 | 1605 | 15'28" | 459 | 149 | 63 | 63 | 3.25 |
| D-16 | 26°55.8' | 115°00.5' | 20 | 2005 | 14'40" | 432 | 140 | 88 | 88 | 3.25 |
| D-17 | 26°53' | 115°00' | 21 | 0055 | 14'40" | 412 | 149 | 90 | 90 | 3.62 |
| D-18 | 26°49.5' | 115°02' | 21 | 0410 | 14'46" | 437 | 146 | 98 | 98 | 3.34 |
| D-19 | 26°46.1' | 115°03.6' | 21 | 0805 | 14'47" | 459 | 143 | 59 | 59 | 3.11 |
| D-20 | 26°40.8' | 115°05.4' | 21 | 1205 | 14'35" | 455 | 139 | 231 | 130 | 3.05 |
| D-21 | 26°39.4' | 115°04.2' | 21 | 1610 | 14'45" | 452 | 142 | 46 | 46 | 3.14 |
| D-22 | 26°37.5' | 115°03.6' | 21 | 2010 | 14'52" | 445 | 142 | 90 | 90 | 3.12 |
| D-23 | 26°33.5' | 115°02.7' | 22 | 0145 | 14'43" | 425 | 142 | 99 | 99 | 3.35 |
| D-24 | 26°32.2' | 115°03.1' | 22 | 0410 | 14'48" | 443 | 138 | 84 | 84 | 3.12 |
| D-25 | 26°28' | 115°03' | 22 | 0815 | 14'58" | 413 | 147 | 99 | 99 | 3.55 |
| D-26 | 26°23.2' | 115°04' | 22 | 1210 | 14'45" | 446 | 142 | 99 | 99 | 3.20 |
| D-27 | 26°21.5' | 115°04' | 22 | 1610 | 14'49" | 457 | 144 | 96 | 96 | 3.15 |
| D-28 | 26°17' | 115°00.8' | 22 | 2015 | 15'02" | 401 | 159 | 127 | 127 | 3.96 |
| D-29 | 26°13.5' | 114°59.8' | 23 | 0015 | 14'56" | 531 | 123 | 139 | 139 | 2.32 |
| D-30 | 26°11.5' | 114°59.9' | 23 | 0405 | 14'50" | 427 | 146 | 117 | 117 | 3.43 |

Table 1.--Station data: grid studies, April 1952--Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1,000 m. ³ water strained | | Standard haul factor |
|---------------|-------------|--------------|--------------|--------------------------|----------------------------|-----------------------|---------------|----------------------------------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | Total | Small organisms only | |
| <i>Anchor</i> | | | <i>April</i> | <i>PST</i> | <i>Minutes and seconds</i> | <i>m.</i> | <i>m.</i> | <i>ml.</i> | <i>ml.</i> | |
| A-1 | 27°15.8' | 114°54.9' | 18 | 0850 | 14'32" | 482 | 139 | 17 | 17 | 2.88 |
| A-2 | 27°15.8' | 114°54.9' | 18 | 1210 | 14'27" | 426 | 148 | 40 | 40 | 3.46 |
| A-3 | 27°15.8' | 114°54.9' | 18 | 1610 | 14'30" | 472 | 138 | 32 | 32 | 2.93 |
| A-4 | 27°15.8' | 114°54.9' | 18 | 2010 | 14'28" | 462 | 136 | 58 | 58 | 2.93 |
| A-5 | 27°15.8' | 114°54.9' | 19 | 0010 | 14'37" | 441 | 142 | 41 | 41 | 3.22 |
| A-6 | 27°15.8' | 114°54.9' | 19 | 0410 | 14'30" | 455 | 141 | 40 | 40 | 3.10 |
| A-7 | 27°16' | 114°55.2' | 19 | 0810 | 14'34" | 508 | 136 | 45 | 45 | 2.68 |
| A-8 | 27°16' | 114°55.2' | 19 | 1210 | 14'30" | 497 | 142 | 42 | 42 | 2.86 |
| A-9 | 27°17.5' | 114°55' | 19 | 1610 | 14'26" | 504 | 137 | 56 | 56 | 2.73 |
| A-10 | 27°14.5' | 114°53' | 19 | 2220 | 14'34" | 495 | 141 | 61 | 61 | 2.85 |
| A-11 | 27°14.5' | 114°54' | 20 | 0616 | 14'31" | 478 | 142 | 61 | 61 | 2.97 |
| A-12 | 27°15.5' | 114°54.5' | 20 | 0410 | 14'44" | 457 | 141 | 66 | 66 | 3.08 |
| A-13 | 27°15' | 114°53.5' | 20 | 0810 | 14'35" | 472 | 139 | 47 | 47 | 2.94 |
| A-14 | 27°15' | 114°53.5' | 20 | 1210 | 14'38" | 478 | 137 | 33 | 33 | 2.87 |
| A-15 | 27°15' | 114°53.5' | 20 | 1610 | 14'07" | 429 | 135 | 37 | 37 | 3.15 |
| A-16 | 27°15' | 114°53.5' | 20 | 2010 | 14'31" | 434 | 142 | 64 | 64 | 3.27 |
| A-17 | 27°15' | 114°53.5' | 21 | 0010 | 14'38" | 444 | 141 | 56 | 56 | 3.18 |
| A-18 | 27°15' | 114°53.5' | 21 | 0410 | 14'20" | 432 | 141 | 60 | 60 | 3.26 |
| A-19 | 27°16.5' | 114°55' | 21 | 0810 | 14'30" | 484 | 138 | 70 | 70 | 2.84 |
| A-20 | 27°15.5' | 114°55' | 21 | 1210 | 14'37" | 486 | 138 | 58 | 58 | 2.83 |
| A-21 | 27°15.5' | 114°56' | 21 | 1610 | 14'34" | 480 | 141 | 42 | 42 | 2.94 |
| A-22 | 27°16.5' | 114°56' | 21 | 2010 | 14'40" | 512 | 136 | 74 | 74 | 2.65 |
| A-23 | 27°15' | 114°55.5' | 22 | 0010 | 15'22" | 519 | 128 | 77 | 77 | 2.46 |
| A-24 | 27°14' | 114°56' | 22 | 0410 | 14'25" | 503 | 132 | 72 | 72 | 2.62 |
| A-25 | 27°08.5' | 114°53.5' | 22 | 0810 | 14'31" | 488 | 132 | 45 | 45 | 2.70 |
| A-26 | 27°08.5' | 114°53.5' | 22 | 1210 | 14'27" | 456 | 142 | 39 | 39 | 3.12 |
| A-27 | 27°08.5' | 114°53.5' | 22 | 1605 | 14'09" | 396 | 159 | 48 | 48 | 4.00 |
| A-28 | 27°08.5' | 114°53.5' | 22 | 2010 | 14'26" | 442 | 141 | 72 | 72 | 3.18 |
| A-29 | 27°08.5' | 114°53.5' | 23 | 0010 | 14'32" | 446 | 137 | 72 | 72 | 3.07 |
| A-30 | 27°08.5' | 114°53.5' | 23 | 0415 | 13'46" | 447 | 127 | 74 | 74 | 2.83 |

Table 1.---Station data: grid studies, April 1952---Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1,000 m. ³ | | Standard haul factor |
|----------------|-------------|--------------|--------------|--------------------------|----------------------------|-----------------------|---------------|-------------------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | Total | Small organisms only | |
| <i>Grid I</i> | | | <i>April</i> | <i>PST</i> | <i>Minutes and seconds</i> | <i>m.</i> | <i>m.</i> | <i>ml.</i> | <i>ml.</i> | |
| GI-1 | 27°06' | 114°50.5' | 18 | 0810 | 14'32" | 524 | 136 | 32 | 32 | 2.59 |
| GI-2 | 27°12.5' | 114°53' | 18 | 0855 | 14'25" | 496 | 141 | 58 | 58 | 2.84 |
| GI-3 | 27°16' | 114°55' | 18 | 0930 | 14'33" | 496 | 142 | 38 | 38 | 2.86 |
| GI-4 | 27°19.2' | 114°57.5' | 18 | 1015 | 14'34" | 489 | 142 | 41 | 41 | 2.90 |
| GI-5 | 27°23' | 114°59.5' | 18 | 1055 | 14'35" | 496 | 142 | 48 | 48 | 2.86 |
| GI-6 | 27°21' | 115°03.5' | 18 | 1130 | 14'34" | 500 | 138 | 22 | 22 | 2.77 |
| GI-7 | 27°17.5' | 115°01' | 18 | 1210 | 14'27" | 485 | 141 | 27 | 27 | 2.91 |
| GI-8 | 27°14' | 114°59' | 18 | 1255 | 14'36" | 507 | 139 | 71 | 71 | 2.74 |
| GI-9 | 27°10.5' | 114°56.5' | 18 | 1335 | 14'28" | 496 | 139 | 48 | 48 | 2.81 |
| GI-10 | 27°07' | 114°54.5' | 18 | 1420 | 14'28" | 492 | 141 | 83 | 83 | 2.86 |
| GI-11 | 27°05' | 114°58.5' | 18 | 1450 | 14'30" | 506 | 142 | 67 | 67 | 2.80 |
| GI-12 | 27°08.5' | 115°00.5' | 18 | 1535 | 14'32" | 503 | 142 | 38 | 38 | 2.82 |
| GI-13 | 27°12' | 115°03' | 18 | 1615 | 14'30" | 534 | 133 | 30 | 30 | 2.49 |
| GI-14 | 27°15.4' | 115°05' | 18 | 1700 | 14'35" | 539 | 133 | 35 | 35 | 2.47 |
| GI-15 | 27°19' | 115°07.5' | 18 | 1740 | 14'28" | 499 | 139 | 58 | 58 | 2.78 |
| GI-16 | 27°17' | 115°11' | 18 | 1825 | 14'27" | 488 | 138 | 100 | 100 | 2.83 |
| GI-17 | 27°13.2' | 115°09' | 18 | 1905 | 14'42" | 503 | 138 | 88 | 88 | 2.74 |
| GI-18 | 27°10' | 115°06.8' | 18 | 1950 | 14'30" | 495 | 140 | 83 | 83 | 2.82 |
| GI-19 | 27°06.4' | 115°04.6' | 18 | 2030 | 14'40" | 489 | 140 | 119 | 119 | 2.86 |
| GI-20 | 27°03' | 115°02.5' | 18 | 2110 | 14'30" | 478 | 140 | 127 | 127 | 2.93 |
| GI-21 | 27°01' | 115°06' | 18 | 2150 | 14'28" | 477 | 141 | 220 | 220 | 2.96 |
| GI-22 | 27°04.5' | 115°08.5' | 18 | 2235 | 14'28" | 480 | 147 | 175 | 175 | 3.06 |
| GI-23 | 27°08.1' | 115°10.6' | 18 | 2320 | 14'35" | 499 | 139 | 154 | 154 | 2.78 |
| GI-24 | 27°11.5' | 115°13' | 18&19 | 0005 | 14'31" | 490 | 142 | 1,093 | 1,093 | 2.90 |
| GI-25 | 27°15' | 115°15' | 19 | 0050 | 14'35" | 500 | 142 | 150 | 150 | 2.84 |
| <i>Grid II</i> | | | | | | | | | | |
| GII-1 | 27°09' | 114°50.8' | 19 | 0810 | 14'26" | 470 | 139 | 40 | 40 | 2.96 |
| GII-2 | 27°12.6' | 114°52.8' | 19 | 0850 | 15'00" | 385 | 150 | 31 | 31 | 3.90 |
| GII-3 | 27°16' | 114°55' | 19 | 0940 | 14'30" | 424 | 141 | 33 | 33 | 3.33 |
| GII-4 | 27°19.5' | 114°57.2' | 19 | 1020 | 14'27" | 419 | 145 | 43 | 43 | 3.45 |
| GII-5 | 27°23' | 114°59.5' | 19 | 1110 | 14'27" | 412 | 142 | 44 | 44 | 3.44 |

Table 1.--Station data: grid studies, April 1952--Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton | | Standard haul factor |
|----------|-------------|--------------|-------|--------------------------|---------------------|-----------------------|---------------|----------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | volume per 1,000 m. ³ | Small organisms only | |
| Grid II | | | April | PST | Minutes and seconds | m. | m. | ml. | ml. | |
| GII-6 | 27°21' | 115°03.4' | 19 | 1145 | 14'36" | 399 | 147 | 55 | 55 | 3.68 |
| GII-7 | 27°17.5' | 115°01' | 19 | 1240 | 14'47" | 375 | 142 | 40 | 40 | 3.80 |
| GII-8 | 27°14' | 114°59' | 19 | 1325 | 14'39" | 437 | 137 | 32 | 32 | 3.13 |
| GII-9 | 27°10.5 | 114°56.5' | 19 | 1410 | 14'41" | 422 | 143 | 52 | 52 | 3.38 |
| GII-10 | 27°07' | 114°54.5' | 19 | 1500 | 14'37" | 432 | 136 | 37 | 37 | 3.15 |
| GII-11 | 27°05' | 114°58.5' | 19 | 1545 | 14'35" | 419 | 141 | 53 | 53 | 3.37 |
| GII-12 | 27°08.5' | 115°00.5' | 19 | 1630 | 13'37" | 370 | 144 | 73 | 73 | 3.90 |
| GII-13 | 27°11.9' | 115°02.8' | 19 | 1715 | 13'51" | 440 | 140 | 57 | 57 | 3.19 |
| GII-14 | 27°15.5' | 115°05' | 19 | 1820 | 13'35" | 426 | 141 | 68 | 68 | 3.30 |
| GII-15 | 27°18.9' | 115°07.2' | 19 | 1900 | 13'44" | 418 | 145 | 55 | 55 | 3.46 |
| GII-16 | 27°16.9' | 115°11.1' | 19 | 1950 | 13'43" | 405 | 140 | 101 | 101 | 3.45 |
| GII-17 | 27°13.5' | 115°09.8' | 19 | 2035 | 14'31" | 438 | 145 | 91 | 91 | 3.30 |
| GII-18 | 27°10' | 115°06.5' | 19 | 2120 | 14'24" | 398 | 153 | 83 | 83 | 3.85 |
| GII-19 | 27°06.5' | 115°04.5' | 19 | 2205 | 14'34" | 454 | 142 | 108 | 108 | 3.14 |
| GII-20 | 27°03' | 115°02.3' | 19 | 2250 | 14'29" | 438 | 143 | 94 | 94 | 3.26 |
| GII-21 | 27°01' | 115°06.2' | 19 | 2335 | 14'22" | 451 | 135 | 84 | 84 | 2.99 |
| GII-22 | 27°04.5' | 115°09' | 20 | 0015 | 14'32" | 444 | 143 | 90 | 90 | 3.22 |
| GII-23 | 27°08' | 115°10.5' | 20 | 0110 | 14'38" | 431 | 147 | 74 | 74 | 3.42 |
| GII-24 | 27°11.5' | 115°13' | 20 | 0145 | 14'37" | 427 | 145 | 73 | 73 | 3.39 |
| GII-25 | 27°15' | 115°15' | 20 | 0240 | 14'37" | 428 | 147 | 82 | 82 | 3.44 |
| Grid III | | | | | | | | | | |
| GIII-1 | 27°08' | 114°50.6 | 20 | 0810 | 14'29" | 496 | 134 | 52 | 52 | 2.70 |
| GIII-2 | 27°12.5' | 114°53' | 20 | 0915 | 14'31" | 488 | 139 | 25 | 25 | 2.86 |
| GIII-3 | 27°16' | 114°52.2' | 20 | 1015 | 14'30" | 499 | 131 | 80 | 80 | 2.63 |
| GIII-4 | 27°19' | 114°54.4' | 20 | 1105 | 14'35" | 463 | 139 | 82 | 82 | 2.99 |
| GIII-5 | 27°23' | 114°59.2 | 20 | 1145 | 14'39" | 486 | 137 | 70 | 70 | 2.82 |
| GIII-6 | 27°21' | 115°03.4' | 20 | 1225 | 14'30" | 476 | 140 | 21 | 21 | 2.94 |
| GIII-7 | 27°17.5' | 115°01' | 20 | 1310 | 14'39" | 483 | 140 | 21 | 21 | 2.90 |
| GIII-8 | 27°14' | 114°59' | 20 | 1350 | 14'36" | 474 | 138 | 44 | 44 | 2.91 |
| GIII-9 | 27°10.5' | 114°56.5' | 20 | 1430 | 14'28" | 459 | 141 | 46 | 46 | 3.07 |
| GIII-10 | 27°07' | 114°54.5' | 20 | 1510 | 14'31" | 479 | 135 | 33 | 33 | 2.82 |

Table 1.--Station data: grid studies, April 1952--Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1000 m ³ water strained | | Standard haul factor |
|-----------------|--------------|-------------|--------------|--------------------------|----------------------------|-----------------------|---------------|--------------------------------------------------------|----------------------|----------------------|
| | N. Longitude | W. Latitude | | | | | | Total | Small organisms only | |
| <i>Grid III</i> | | | <i>April</i> | <i>PST</i> | <i>Minutes and seconds</i> | <i>m.</i> | <i>m.</i> | <i>ml.</i> | <i>ml.</i> | |
| GIII-11 | 27°05' | 114°58.5' | 20 | 1545 | 14'30" | 471 | 141 | 68 | 68 | 2.99 |
| GIII-12 | 27°08.5' | 115°00.5' | 20 | 1630 | 14'30" | 487 | 140 | 60 | 60 | 2.87 |
| GIII-13 | 27°12' | 115°03' | 20 | 1710 | 14'31" | 480 | 139 | 60 | 60 | 2.89 |
| GIII-14 | 27°15.4' | 115°05' | 20 | 1755 | 14'31" | 478 | 139 | 59 | 59 | 2.91 |
| GIII-15 | 27°19' | 115°07' | 20 | 1845 | 14'41" | 504 | 139 | 87 | 87 | 2.76 |
| GIII-16 | 27°17' | 115°11' | 20 | 1930 | 14'34" | 488 | 138 | 123 | 123 | 2.82 |
| GIII-17 | 27°13' | 115°09' | 20 | 2015 | 14'30" | 490 | 137 | 129 | 129 | 2.88 |
| GIII-18 | 27°10' | 115°06.8' | 20 | 2055 | 14'41" | 481 | 138 | 127 | 127 | 2.80 |
| GIII-19 | 27°06.4' | 115°04.6' | 20 | 2140 | 14'35" | 483 | 140 | 120 | 120 | 2.90 |
| GIII-20 | 27°03' | 115°02.5' | 20 | 2225 | 14'33" | 478 | 141 | 117 | 117 | 2.94 |
| GIII-21 | 27°01' | 115°06.5' | 20 | 2350 | 14'40" | 506 | 140 | 89 | 89 | 2.76 |
| GIII-22 | 27°04.5' | 115°08.5' | 21 | 0035 | 14'30" | 488 | 140 | 76 | 76 | 2.86 |
| GIII-23 | 27°08.5' | 115°10.6' | 21 | 0120 | 14'30" | 472 | 140 | 138 | 138 | 2.96 |
| GIII-24 | 27°11.5' | 115°13' | 21 | 0205 | 14'34" | 473 | 141 | 108 | 108 | 2.98 |
| GIII-25 | 27°15' | 115°15' | 21 | 0250 | 14'34" | 470 | 139 | 72 | 72 | 2.96 |
| <i>Grid IV</i> | | | | | | | | | | |
| GIV-1 | 27°09' | 114°50.8' | 21 | 0810 | 14'39" | 498 | 127 | 36 | 36 | 2.55 |
| GIV-2 | 27°12.6' | 114°52.8' | 21 | 0855 | 14'24" | 464 | 134 | 60 | 60 | 2.89 |
| GIV-3 | 27°16' | 114°55' | 21 | 0955 | 14'32" | 423 | 143 | 52 | 52 | 3.38 |
| GIV-4 | 27°19.5' | 114°57.2' | 21 | 1040 | 14'28" | 439 | 131 | 32 | 32 | 2.98 |
| GIV-5 | 27°23' | 114°59.5' | 21 | 1125 | 14'28" | 442 | 140 | 43 | 43 | 3.17 |
| GIV-6 | 27°21' | 115°03.4' | 21 | 1210 | 14'37" | 443 | 141 | 38 | 38 | 3.19 |
| GIV-7 | 27°17.5' | 115°01' | 21 | 1255 | 14'37" | 449 | 136 | 31 | 31 | 3.04 |
| GIV-8 | 27°14' | 114°59' | 21 | 1335 | 14'37" | 425 | 143 | 24 | 24 | 3.36 |
| GIV-9 | 27°10.5' | 114°54.5' | 21 | 1425 | 14'32" | 434 | 139 | 25 | 25 | 3.20 |
| GIV-10 | 27°07' | 114°54.5' | 21 | 1510 | 14'34" | 430 | 140 | 51 | 51 | 3.27 |
| GIV-11 | 27°05' | 114°58.5' | 21 | 1555 | 14'32" | 422 | 144 | 36 | 36 | 3.41 |
| GIV-12 | 27°08.5' | 115°00.5' | 21 | 1640 | 14'05" | 401 | 144 | 27 | 27 | 3.59 |
| GIV-13 | 27°12' | 115°03' | 21 | 1735 | 13'59" | 407 | 144 | 25 | 25 | 3.54 |
| GIV-14 | 27°15.5' | 115°05' | 21 | 1825 | 14'14" | 420 | 143 | 41 | 41 | 3.41 |
| GIV-15 | 27°19' | 115°07.5' | 21 | 1915 | 13'59" | 388 | 145 | 62 | 62 | 3.74 |

Table 1.--Station data: grid studies, April 1952--Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1,000 m. ³ | | Standard haul factor |
|----------------|-------------|--------------|--------------|--------------------------|----------------------------|-----------------------|---------------|-------------------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | Total | Small organisms only | |
| <i>Grid IV</i> | | | <i>April</i> | <i>PSI</i> | <i>Minutes and seconds</i> | <i>m.</i> | <i>m.</i> | <i>ml.</i> | <i>ml.</i> | |
| GIV-16 | 27°17' | 115°11.5' | 21 | 1945 | 14'05" | 382 | 146 | 60 | 60 | 3.82 |
| GIV-17 | 27°13.5' | 115°09.8' | 21 | 2035 | 14'28" | 418 | 146 | 335 | 270 | 3.48 |
| GIV-18 | 27°10' | 115°06.5' | 21 | 2120 | 14'29" | 426 | 145 | 73 | 73 | 3.40 |
| GIV-19 | 27°06.5' | 115°04.5' | 21 | 2210 | 14'26" | 434 | 142 | 53 | 53 | 3.26 |
| GIV-20 | 27°03' | 115°02.3' | 21 | 2245 | 14'29" | 437 | 145 | 53 | 53 | 3.32 |
| GIV-21 | 27°01' | 115°06.2' | 21 | 2325 | 14'28" | 436 | 141 | 80 | 80 | 3.24 |
| GIV-22 | 27°04.5' | 115°09' | 22 | 0015 | 14'36" | 423 | 145 | 80 | 80 | 3.43 |
| GIV-23 | 27°08' | 115°10.5' | 22 | 0100 | 14'38" | 434 | 139 | 76 | 76 | 3.20 |
| GIV-24 | 27°11.5' | 115°13' | 22 | 0150 | 14'33" | 425 | 140 | 78 | 61 | 3.30 |
| GIV-25 | 27°15' | 115°15' | 22 | 0240 | 14'35" | 428 | 141 | 67 | 67 | 3.35 |
| <i>Grid V</i> | | | | | | | | | | |
| GV-1 | 27°09.5' | 114°52.5' | 22 | 0810 | 14'03" | 483 | 134 | 83 | 83 | 2.77 |
| GV-2 | 27°13' | 114°55' | 22 | 0855 | 14'18" | 491 | 137 | 55 | 55 | 2.80 |
| GV-3 | 27°16' | 114°55' | 22 | 0950 | 14'15" | 486 | 137 | 37 | 37 | 2.82 |
| GV-4 | 27°19.2' | 114°58' | 22 | 1025 | 14'15" | 486 | 140 | 58 | 58 | 2.89 |
| GV-5 | 27°23' | 114°59.5' | 22 | 1110 | 14'08" | 464 | 138 | 39 | 39 | 2.97 |
| GV-6 | 27°21' | 115°03.5' | 22 | 1140 | 14'19" | 492 | 139 | 89 | 89 | 2.82 |
| GV-7 | 27°17.5' | 115°01' | 22 | 1230 | 14'32" | 464 | 141 | 91 | 91 | 3.04 |
| GV-8 | 27°14' | 114°59' | 22 | 1310 | 14'30" | 465 | 141 | 58 | 58 | 3.04 |
| GV-9 | 27°10' | 114°56.5' | 22 | 1350 | 14'31" | 465 | 144 | 108 | 108 | 3.09 |
| GV-10 | 27°07' | 114°54.5' | 22 | 1425 | 14'29" | 463 | 139 | 52 | 52 | 3.00 |
| GV-11 | 27°05' | 114°58.5' | 22 | 1510 | 14'35" | 473 | 142 | 228 | 228 | 3.00 |
| GV-12 | 27°08.5' | 115°00.5' | 22 | 1550 | 14'23" | 469 | 142 | 62 | 62 | 3.04 |
| GV-13 | 27°12' | 115°03' | 22 | 1635 | 14'30" | 475 | 142 | 29 | 29 | 2.99 |
| GV-14 | 27°15.4' | 115°05' | 22 | 1720 | 14'35" | 473 | 142 | 49 | 49 | 3.01 |
| GV-15 | 27°19' | 115°07.5' | 22 | 1805 | 14'31" | 474 | 142 | 53 | 53 | 3.00 |
| GV-16 | 27°17' | 115°11' | 22 | 1845 | 14'20" | 468 | 140 | 75 | 75 | 3.00 |
| GV-17 | 27°13.2' | 115°09' | 22 | 1925 | 14'31" | 469 | 137 | 94 | 94 | 2.92 |
| GV-18 | 27°10' | 115°06.8' | 22 | 1955 | 14'35" | 488 | 134 | 100 | 100 | 2.75 |
| GV-19 | 27°06.4' | 115°04.6' | 22 | 2035 | 14'33" | 460 | 136 | 96 | 96 | 2.96 |

Table 1.--Station data: grid studies, April 1952--Continued

| Station | Position | | Date | Time of tow ¹ | Duration of haul | Volume water strained | Depth of haul | Plankton volume per 1,000 m. ³ | | Standard haul factor |
|---------|-------------|--------------|-------|--------------------------|---------------------|-----------------------|---------------|-------------------------------------------|----------------------|----------------------|
| | Latitude N. | Longitude W. | | | | | | Total | Small organisms only | |
| Grid V | | | April | PST | Minutes and seconds | m. | m. | ml. | ml. | |
| GV-20 | 27°03' | 115°02.5' | 22 | 2115 | 14'32" | 466 | 136 | 54 | 54 | 2.92 |
| GV-21 | 27°01' | 115°06' | 22 | 2200 | 14'30" | 470 | 135 | 91 | 91 | 2.87 |
| GV-22 | 27°04.5' | 115°08.5' | 22 | 2245 | 14'29" | 460 | 135 | 78 | 78 | 2.94 |
| GV-23 | 27°08.1' | 115°10.6' | 22 | 2330 | 14'32" | 470 | 137 | 72 | 72 | 2.91 |
| GV-24 | 27°11.5' | 115°13' | 23 | 0015 | 14'30" | 469 | 138 | 85 | 85 | 2.94 |
| GV-25 | 27°15' | 115°15' | 23 | 0100 | 14'30" | 454 | 143 | 60 | 60 | 3.14 |

¹ Nearest 5 minutes to mid-point of tow.

Age categories, A to D, into which sardine eggs are classified, are as follows:

- A- 1 day old. Eggs spawned within 24 hours of collection.
- B- 2 days old. Eggs spawned between 24.1 to 48 hours of collection.
- C- 3 days old. Eggs spawned between 48.1 to 72 hours of collection.
- D- 4 days old. Eggs spawned between 72.1 to 96 hours of collection.
- Unclassified (uncl.). Deteriorated eggs.

A dash (-) in table indicates an age category which could not be present because temperatures were high enough to have hatched the eggs before they reached that age.

A zero (0) value indicates that although no eggs were taken they could have been present according to temperature and time of collection.

Sardine eggs were collected at every drogue station with the greatest numbers per haul occurring in the grid area (table 2a). New spawning occurred throughout the range of the drogue trajectory. Ten-meter temperatures ranged from 15.71⁰ to 16.26⁰ C, which allowed for a maximum embryonic period of only 3 days, except at station D-28 where a few 4-day-old eggs were collected and at station D-29, where, although no eggs were collected, 4-day-olds could have been present, although temperatures at these stations were 16.23⁰ C, and 16.19⁰ C, respectively. Four-day-olds at station D-28 were present either because the eldest category was just over 3 days from spawning (in fact only one-quarter of an hour over) or they might have been taken from colder regions below the 10-meter level and had a longer period of development. The possibility of 4-day-old eggs at station D-29 can be reasoned only on the basis of time of collection. Samples at the anchor station were collected from water that had been transported southward to that area. Egg collections during the first 3 days showed that very little new spawning was occurring. On the fourth and fifth days of collection, however, new spawning became heavy (table 2a, stations A-19 and A-29). Temperatures ranged from 15.67⁰ to 16.23⁰ C., allowing for only 3 days from spawning to hatching.

Sardine eggs, 1 to 3 days old, were collected every day on the grid pattern. The greatest

concentrations were usually in the eastern (inshore) half of the grid (fig. 2). On the first 3 days of coverage there were no eggs at some of the stations. On the fourth and fifth days, eggs were found at all stations. These were primarily 1-day-old eggs on Grid IV and 1- and 2-day-old eggs on Grid V (table 2b).

The current through the grid, as demonstrated by the drogue trajectory, probably changed the egg and larval population once each day. Thus, each day's older eggs were those spawned in areas north of the grid. When collections were begun at 0800 hours on each day, both 1-day-old eggs and previously spawned eggs were present in the grid and north of it. By the time the ship reached the western section of the grid at 2000 hours, new spawning had begun. The eggs, which had been to the north at the beginning of the day's sampling run had moved into the grid, were 12+ hours older and had entered their next age category. Because sampling the grid was an attempt to obtain each day's eggs as a single unit, these advanced eggs were listed by their spawning day and consequently in the same age category as those collected earlier, as though they had been collected simultaneously over the entire grid. Eggs spawned after 2000 hours in each day's grid collections are listed only under a date of spawning in the age category columns (table 2b). When collections began again on each following day, those eggs were out of the grid, but the 1-day-old group from north of the grid was being sampled in that day's collections and were thus listed as 1-day eggs.

FISH LARVAE

The differences in numbers of the different species of larvae in this survey reflect both differences in the relative numbers of adults in the area and the relation of the time of the survey to the time of peak spawning for each species. Of the larvae, sardines were the most abundant, for they represented about 71 percent of all larvae taken by all ships during the 5-day survey, 67 percent of all larvae taken in the five grids, 79 percent of all larvae taken on the anchor stations, and 81 percent of all larvae taken at the drogue stations (table 3; fig. 3). The larvae of other commercial

Table 2a.--Sardine eggs, by age in days, collected on drogue and anchor stations.

| Station | Number of normal eggs | | | | | Total number of eggs | | | | |
|---------------|-----------------------|-------|-------|---|-------|----------------------|-------|---|--------------|--------|
| | A | B | C | D | A | B | C | D | Unclassified | N |
| <i>Drogue</i> | | | | | | | | | | |
| D-1 | 176 | 3 | 0 | - | 329 | 3 | 0 | - | 14 | 346 |
| D-2 | 331 | 42 | 0 | - | 636 | 61 | 0 | - | 10 | 707 |
| D-3 | 190 | 29 | 0 | - | 629 | 55 | 0 | - | 78 | 762 |
| D-4 | 0 | 421 | 266 | - | 0 | 654 | 334 | - | 48 | 1,036 |
| D-5 | 0 | 184 | 65 | - | 0 | 368 | 113 | - | 50 | 531 |
| D-6 | 12 | 233 | 43 | - | 17 | 380 | 92 | - | 86 | 575 |
| D-7 | 177 | 455 | 179 | - | 248 | 651 | 243 | - | 64 | 1,206 |
| D-8 | 142 | 680 | 258 | - | 227 | 797 | 268 | - | 22 | 1,314 |
| D-9 | 101 | 617 | 63 | - | 185 | 797 | 71 | - | 38 | 1,091 |
| D-10 | 0 | 89 | 651 | - | 0 | 166 | 858 | - | 50 | 1,074 |
| D-11 | 0 | 27 | 458 | - | 0 | 41 | 501 | - | 6 | 548 |
| D-12 | No sample. | | | | | | | | | |
| D-13 | 0 | 35 | 340 | - | 0 | 44 | 369 | - | 0 | 413 |
| D-14 | 0 | 43 | 151 | - | 0 | 82 | 190 | - | 7 | 279 |
| D-15 | 0 | 29 | 32 | - | 0 | 45 | 39 | - | 0 | 84 |
| D-16 | 0 | 3 | 26 | - | 0 | 3 | 32 | - | 0 | 35 |
| D-17 | 0 | 0 | 29 | - | 0 | 0 | 29 | - | 0 | 29 |
| D-18 | 0 | 0 | 43 | - | 0 | 0 | 43 | - | 0 | 43 |
| D-19 | 0 | 0 | 22 | - | 0 | 0 | 34 | - | 0 | 34 |
| D-20 | 6 | 3 | 27 | - | 6 | 3 | 30 | - | 0 | 39 |
| D-21 | 3 | 3 | - | - | 3 | 3 | - | - | 0 | 6 |
| D-22 | 0 | 6 | 3 | - | 0 | 6 | 3 | - | 0 | 9 |
| D-23 | 0 | 0 | 3 | - | 0 | 0 | 7 | - | 0 | 7 |
| D-24 | 22 | 0 | 6 | - | 94 | 0 | 9 | - | 9 | 112 |
| D-25 | 124 | 0 | 0 | - | 195 | 0 | 0 | - | 7 | 202 |
| D-26 | 35 | 3 | 0 | - | 67 | 3 | 0 | - | 3 | 73 |
| D-27 | 41 | 0 | - | - | 107 | 3 | - | - | 0 | 110 |
| D-28 | 0 | 24 | 0 | 8 | 0 | 32 | 8 | 8 | 0 | 48 |
| D-29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D-30 | 0 | 3 | 0 | - | 0 | 3 | 0 | - | 0 | 3 |
| Total | 1,360 | 2,932 | 2,665 | 8 | 2,743 | 4,200 | 3,273 | 8 | 492 | 10,716 |

Table 2a.--Sardine eggs, drogue and anchor stations--Continued

| Station | Number of Normal Eggs | | | | Total Number of Eggs | | | | n |
|---------|-----------------------|--------|--------|---|----------------------|--------|--------|---|--------|
| | A | B | C | D | A | B | C | D | |
| Anchor | | | | | | | | | |
| A-1 | 0 | 536 | 798 | - | 0 | 1,264 | 1,884 | - | 276 |
| A-2 | 0 | 2,090 | 813 | - | 0 | 2,432 | 1,076 | - | 38 |
| A-3 | 9 | 1,424 | 18 | - | 9 | 1,749 | 18 | - | 9 |
| A-4 | 0 | 15 | 1,054 | - | 0 | 26 | 1,313 | - | 0 |
| A-5 | 0 | 3 | 448 | - | 0 | 3 | 1,137 | - | 19 |
| A-6 | 3 | 0 | 763 | - | 3 | 0 | 995 | - | 0 |
| A-7 | 0 | 0 | 1,032 | - | 0 | 0 | 1,032 | - | 0 |
| A-8 | 6 | 0 | 315 | - | 14 | 0 | 383 | - | 3 |
| A-9 | 33 | 16 | 49 | - | 49 | 16 | 66 | - | 0 |
| A-10 | 0 | 9 | 9 | - | 0 | 17 | 83 | - | 37 |
| A-11 | 0 | 77 | 80 | - | 0 | 86 | 107 | - | 0 |
| A-12 | 0 | 46 | 6 | - | 0 | 108 | 19 | - | 15 |
| A-13 | 0 | 418 | 400 | - | 0 | 747 | 576 | - | 41 |
| A-14 | 17 | 207 | 276 | - | 17 | 258 | 321 | - | 0 |
| A-15 | 13 | 107 | 3 | - | 85 | 205 | 44 | - | 35 |
| A-16 | 0 | 62 | 33 | - | 0 | 160 | 46 | - | 29 |
| A-17 | 0 | 293 | 38 | - | 0 | 369 | 57 | - | 19 |
| A-18 | 522 | 6 | 26 | - | 926 | 6 | 26 | - | 98 |
| A-19 | 2,016 | 6 | 28 | - | 2,607 | 11 | 40 | - | 57 |
| A-20 | 1,460 | 0 | 17 | - | 2,587 | 0 | 17 | - | 40 |
| A-21 | 1,064 | 24 | 0 | - | 2,846 | 35 | 0 | - | 206 |
| A-22 | 0 | 928 | 21 | - | 0 | 1,866 | 26 | - | 238 |
| A-23 | 0 | 3,975 | 128 | - | 0 | 4,753 | 167 | - | 148 |
| A-24 | 120 | 2,683 | 162 | - | 120 | 3,988 | 210 | - | 304 |
| A-25 | 0 | 3,256 | 1,793 | - | 0 | 4,590 | 3,013 | - | 740 |
| A-26 | 480 | 5,653 | 206 | - | 1,398 | 8,274 | 368 | - | 505 |
| A-27 | 1,340 | 2,308 | 12 | - | 2,200 | 2,940 | 12 | - | 140 |
| A-28 | 0 | 286 | 1,730 | - | 0 | 642 | 2,449 | - | 38 |
| A-29 | 0 | 338 | 1,329 | - | 0 | 448 | 1,710 | - | 18 |
| A-30 | 0 | 14 | 323 | - | 0 | 17 | 467 | - | 6 |
| Total | 7,083 | 24,780 | 11,910 | - | 12,861 | 35,010 | 17,662 | - | 3,059 |
| | | | | - | | | | - | 68,592 |

Table 2b.--Sardine eggs, by age categories (age in days), day of spawning and day of collection on Grids I-V.

| Date of survey | Station | Age category | | | | | | | | | | Unclassi- fied | n |
|----------------------|---------|----------------------------|-------|---------------------------------|-------|---------------------------------|--------|---------------------------------|-------|---------------------------------|-------|-------------------|--------|
| | | Spawmed April 19 and 20 | | A Spawmed April 18 and 19 | | B Spawmed April 17 and 18 | | C Spawmed April 16 and 17 | | D Spawmed April 15 and 16 | | | |
| | | Number | Total | Number | Total | Number | Total | Number | Total | Number | Total | | |
| | | | | | | | | | | | | | |
| April 18 | Grid I | | | | | | | | | | | | |
| | GI-1 | - | - | 0 | 0 | 285 | 417 | 2,261 | 3,307 | - | - | 75 | 3,799 |
| | GI-2 | - | - | 3 | 3 | 2,264 | 2,460 | 2,315 | 2,411 | - | - | 0 | 4,874 |
| | GI-3 | - | - | 3 | 3 | 1,710 | 1,922 | 1,444 | 1,602 | - | - | 0 | 3,527 |
| | GI-4 | - | - | 0 | 0 | 1,201 | 1,372 | 557 | 592 | - | - | 6 | 1,970 |
| | GI-5 | - | - | 0 | 0 | 1,035 | 1,124 | 355 | 380 | - | - | 6 | 1,510 |
| | TI-6 | - | - | 147 | 246 | 1,582 | 2,368 | 100 | 100 | - | - | 28 | 2,742 |
| | GI-7 | - | - | 26 | 163 | 576 | 774 | 50 | 61 | - | - | 18 | 1,016 |
| | GI-8 | - | - | 107 | 356 | 1,047 | 1,225 | 85 | 99 | - | - | 16 | 1,696 |
| | GI-9 | - | - | 17 | 374 | 1,014 | 1,388 | 48 | 53 | - | - | 45 | 1,860 |
| | GI-10 | - | - | 149 | 698 | 1,158 | 1,736 | 11 | 11 | - | - | 49 | 2,494 |
| | GI-11 | - | - | 34 | 118 | 50 | 95 | 14 | 14 | - | - | 20 | 247 |
| | GI-12 | - | - | 45 | 138 | 135 | 194 | 3 | 3 | - | - | 14 | 349 |
| | GI-13 | - | - | 47 | 127 | 80 | 112 | 0 | 5 | - | - | 0 | 244 |
| | GI-14 | - | - | 69 | 212 | 232 | 363 | 0 | 0 | - | - | 22 | 597 |
| | GI-15 | - | - | 0 | 8 | 0 | 6 | 0 | 0 | - | - | 3 | 17 |
| | GI-16 | - | - | 11 | 14 | 0 | 0 | 0 | 0 | - | - | 0 | 14 |
| | GI-17 | - | - | 8 | 16 | 0 | 0 | 0 | 0 | - | - | 0 | 16 |
| | GI-18 | - | - | 11 | 28 | 6 | 6 | 0 | 0 | - | - | 0 | 34 |
| | GI-19 | 0 | 0 | 3 | 3 | 6 | 23 | 0 | 0 | - | - | 3 | 29 |
| | GI-20 | 0 | 0 | 12 | 23 | 26 | 38 | 0 | 0 | - | - | 0 | 61 |
| | GI-21 | 0 | 0 | 24 | 36 | 24 | 30 | 0 | 0 | - | - | 0 | 66 |
| | GI-22 | 0 | 0 | 18 | 18 | 0 | 0 | 0 | 0 | - | - | 0 | 18 |
| | GI-23 | 0 | 0 | 25 | 31 | 0 | 0 | 0 | 0 | - | - | 0 | 31 |
| | GI-24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| GI-25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 | |
| Total | | 0 | 0 | 759 | 2,615 | 12,431 | 15,653 | 7,243 | 8,638 | - | - | 305 | 27,211 |

Table 2b.--Sardine eggs, by age categories (age in days), day of spawning and day of collection on Grids I-V.--Continued

| Date of survey | Age category | | | | | | | | | | | Unclassified | n |
|----------------|--------------|--------------------------------------|-------|------------------------------|-------|------------------------------|-------|------------------------------|-------|------------------------------|-------|--------------|-------|
| | Station | Spawned April 20 and 21 ¹ | | A Spawned April 19 and 20 | | B Spawned April 18 and 19 | | C Spawned April 17 and 18 | | D Spawned April 16 and 17 | | | |
| | | Number | Total | Number | Total | Number | Total | Number | Total | Number | Total | | |
| April 19 | Grid II | | | | | | | | | | | | |
| | GII-1 | - | - | 0 | 0 | 0 | 0 | 12 | 15 | - | - | 0 | 15 |
| | GII-2 | - | - | 16 | 16 | 0 | 0 | 928 | 998 | - | - | 0 | 1,014 |
| | GII-3 | - | - | 10 | 13 | 0 | 0 | 1,046 | 1,172 | - | - | 0 | 1,185 |
| | GII-4 | - | - | 21 | 28 | 28 | 31 | 852 | 994 | - | - | 0 | 1,053 |
| | GII-5 | - | - | 54 | 120 | 88 | 105 | 551 | 632 | - | - | 2 | 859 |
| | GII-6 | - | - | 11 | 110 | 210 | 280 | 0 | 0 | - | - | 0 | 390 |
| | GII-7 | - | - | 19 | 65 | 418 | 612 | 27 | 30 | - | - | 19 | 726 |
| | GII-8 | - | - | 28 | 78 | 1,002 | 1,111 | 372 | 394 | - | - | 3 | 1,586 |
| | GII-9 | - | - | 30 | 95 | 108 | 149 | 81 | 105 | - | - | 20 | 369 |
| | GII-10 | - | - | 25 | 91 | 32 | 44 | 32 | 35 | - | - | 9 | 179 |
| | GII-11 | - | - | 40 | 78 | 125 | 131 | 10 | 14 | - | - | 0 | 223 |
| | GII-12 | - | - | 4 | 8 | 62 | 78 | 8 | 12 | - | - | 0 | 98 |
| | GII-13 | - | - | 10 | 13 | 3 | 3 | - | 0 | - | - | 0 | 16 |
| | GII-14 | - | - | 0 | 0 | 3 | 3 | 0 | 0 | - | - | 0 | 3 |
| | GII-15 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | GII-16 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | GII-17 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | GII-18 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | GII-19 | 0 | 0 | 0 | 0 | 47 | 82 | 0 | 0 | - | - | 9 | 91 |
| | GII-20 | 0 | 0 | 0 | 0 | 20 | 33 | 0 | 0 | - | - | 0 | 33 |
| | GII-21 | 0 | 0 | 0 | 0 | 9 | 9 | 0 | 0 | - | - | 0 | 9 |
| | GII-22 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | - | - | 0 | 3 |
| | GII-23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | GII-24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| GII-25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 | |
| Total | 0 | 0 | 268 | 715 | 2,158 | 2,674 | 3,919 | 4,401 | - | - | 62 | 7,852 | |

Table 2b.--Sardine eggs, by age categories (age in days), day of spawning and day of collection on Grids I-V.--Continued

| Date of survey | Station | Age category | | | | | | | | | | Unclassified | n | |
|----------------|----------|-----------------------------------------|-------|---------------------------------|-------|---------------------------------|-------|---------------------------------|-------|---------------------------------|-------|--------------|-------|----|
| | | Spawmed April 21 and 22 ¹ | | A Spawmed April 20 and 21 | | B Spawmed April 19 and 20 | | C Spawmed April 18 and 19 | | D Spawmed April 17 and 18 | | | | |
| | | Number | Total | Number | Total | Number | Total | Number | Total | Number | Total | | | |
| April 20 | Grid III | | | | | | | | | | | | | |
| | GIII-1 | - | - | 0 | 0 | 0 | 3 | 3 | 3 | - | - | 3 | 9 | 3 |
| | GIII-2 | - | - | 0 | 0 | 12 | 23 | 9 | 9 | - | - | - | 32 | 0 |
| | GIII-3 | - | - | 5 | 5 | 350 | 444 | 450 | 613 | - | - | - | 1,104 | 42 |
| | GIII-4 | - | - | 150 | 236 | 57 | 72 | 110 | 114 | - | - | - | 422 | 0 |
| | GIII-5 | - | - | 51 | 73 | 90 | 99 | 11 | 11 | - | - | - | 200 | 17 |
| | GIII-6 | - | - | 0 | 0 | 6 | 12 | 0 | 0 | - | - | - | 12 | 0 |
| | GIII-7 | - | - | 3 | 3 | 9 | 9 | 32 | 41 | - | - | - | 53 | 0 |
| | GIII-8 | - | - | 23 | 44 | 300 | 457 | 303 | 393 | - | - | - | 923 | 29 |
| | GIII-9 | - | - | 0 | 3 | 120 | 172 | 104 | 129 | - | - | - | 313 | 9 |
| | GIII-10 | - | - | 0 | 0 | 62 | 73 | 37 | 62 | - | - | - | 135 | 0 |
| | GIII-11 | - | - | 30 | 51 | 0 | 6 | 0 | 0 | - | - | - | 57 | 0 |
| | GIII-12 | - | - | 0 | 0 | 3 | 3 | 0 | 0 | - | - | - | 3 | 0 |
| | GIII-13 | - | - | 0 | 0 | 0 | 0 | 3 | 3 | - | - | - | 3 | 0 |
| April 21 | GIII-14 | No sample. | | | | | | | | | | | | |
| | GIII-15 | - | - | 3 | 6 | 0 | 0 | 0 | 0 | - | - | - | 6 | 0 |
| | GIII-16 | - | - | 3 | 8 | 14 | 20 | 0 | 0 | - | - | - | 36 | 8 |
| | GIII-17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 |
| | GIII-23 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | - | - | - | 3 | 0 |
| | GIII-24 | 15 | 30 | 33 | 45 | 6 | 12 | 0 | 0 | - | - | - | 120 | 33 |
| | GIII-25 | 18 | 110 | 56 | 62 | 426 | 497 | 0 | 0 | - | - | - | 716 | 47 |
| Total | | 33 | 140 | 357 | 536 | 1,458 | 1,905 | 1,062 | 1,378 | - | - | 188 | 4,147 | |

Table 2b.--Sardine eggs, by age categories (age in days), day of spawning and day of collection on Grids I-V.--Continued

| Date of survey | Station | Age category | | | | | | | | | | Unclassified | n |
|----------------|---------|-----------------------------------------|-------|---------------------------------|--------|---------------------------------|-------|---------------------------------|-------|---------------------------------|-------|--------------|--------|
| | | Spawmed April 22 and 23 ¹ | | A Spawmed April 21 and 22 | | B Spawmed April 20 and 21 | | C Spawmed April 19 and 20 | | D Spawmed April 18 and 19 | | | |
| | | Number | Total | Number | Total | Number | Total | Number | Total | Number | Total | | |
| April 21 | Grid IV | | | | | | | | | | | | |
| | GIV-1 | - | - | 0 | 0 | 936 | 1,229 | 102 | 107 | - | - | 31 | 1,367 |
| | GIV-2 | - | - | 2,526 | 3,266 | 92 | 98 | 29 | 29 | - | - | 12 | 3,405 |
| | GIV-3 | - | - | 4,590 | 7,084 | 7 | 14 | 20 | 20 | - | - | 34 | 7,152 |
| | GIV-4 | - | - | 1,675 | 3,689 | 48 | 54 | 54 | 54 | - | - | 155 | 3,952 |
| | GIV-5 | - | - | 919 | 2,219 | 507 | 571 | 301 | 301 | - | - | 79 | 3,170 |
| | GIV-6 | - | - | 179 | 450 | 13 | 26 | 0 | 0 | - | - | 124 | 600 |
| | GIV-7 | - | - | 268 | 581 | 0 | 0 | 0 | 0 | - | - | 43 | 624 |
| | GIV-8 | - | - | 70 | 235 | 0 | 0 | 0 | 0 | - | - | 3 | 238 |
| | GIV-9 | - | - | 166 | 483 | 0 | 0 | 6 | 6 | - | - | 125 | 614 |
| April 22 | GIV-10 | - | - | 765 | 1,668 | 92 | 98 | 33 | 33 | - | - | 0 | 1,799 |
| | GIV-11 | - | - | 280 | 672 | 7 | 14 | 24 | 27 | - | - | 68 | 781 |
| | GIV-12 | - | - | 65 | 108 | 0 | 0 | 0 | 0 | - | - | 7 | 115 |
| | GIV-13 | - | - | 11 | 11 | 0 | 0 | 0 | 0 | - | - | 0 | 11 |
| | GIV-14 | - | - | 10 | 41 | 0 | 0 | 0 | 0 | - | - | 3 | 44 |
| | GIV-15 | - | - | 105 | 269 | 52 | 60 | 0 | 0 | - | - | 4 | 333 |
| | GIV-16 | - | - | 122 | 195 | 73 | 76 | 11 | 11 | - | - | 0 | 282 |
| | GIV-17 | 0 | 0 | 237 | 362 | 28 | 28 | 0 | 0 | - | - | 10 | 400 |
| | GIV-18 | 0 | 0 | 48 | 116 | 24 | 34 | 0 | 0 | - | - | 7 | 157 |
| | GIV-19 | 0 | 0 | 13 | 16 | 0 | 0 | 0 | 0 | - | - | 0 | 16 |
| | GIV-20 | 0 | 0 | 3 | 7 | 0 | 0 | 0 | 0 | - | - | 0 | 7 |
| | GIV-21 | 0 | 0 | 16 | 26 | 0 | 0 | 0 | 0 | - | - | 0 | 26 |
| | GIV-22 | 3 | 3 | 86 | 120 | 3 | 10 | 0 | 0 | - | - | 21 | 154 |
| | GIV-23 | 13 | 13 | 179 | 323 | 35 | 51 | 0 | 0 | - | - | 32 | 419 |
| | GIV-24 | 43 | 50 | 116 | 116 | 102 | 132 | 0 | 0 | - | - | 135 | 433 |
| Total | GIV-25 | 90 | 127 | 47 | 107 | 131 | 154 | 0 | 0 | - | - | 84 | 472 |
| | | 149 | 193 | 12,496 | 22,164 | 2,150 | 2,649 | 580 | 588 | - | - | 977 | 26,571 |

Table 2b.--Sardine eggs, by age categories (age in days,) day of spawning and day of collection on Grids I-V.--Continued

| Date of Survey | Station | Age category | | | | | | | | | | Unclassified | n |
|----------------|---------|--------------------------------------|-------|------------------------------|--------|------------------------------|--------|------------------------------|-------|------------------------------|-------|--------------|---------|
| | | Spawned April 23 and 24 ¹ | | A Spawned April 22 and 23 | | B Spawned April 21 and 22 | | C Spawned April 20 and 21 | | D Spawned April 19 and 20 | | | |
| | | Number | Total | Number | Total | Number | Total | Number | Total | Number | Total | | |
| April 22 | Grid V | | | | | | | | | | | | |
| | GV-1 | - | - | 338 | 416 | 5,972 | 6,498 | 338 | 416 | - | - | 188 | 7,518 |
| | GV-2 | - | - | 6,598 | 9,923 | 3,573 | 4,424 | 616 | 683 | - | - | 538 | 15,568 |
| | GV-3 | - | - | 1,015 | 1,743 | 3,198 | 3,768 | 570 | 694 | - | - | 124 | 6,329 |
| | GV-4 | - | - | 399 | 1,445 | 1,751 | 2,329 | 358 | 445 | - | - | 220 | 4,439 |
| | GV-5 | - | - | 27 | 62 | 442 | 1,134 | 151 | 457 | - | - | 244 | 1,897 |
| | GV-6 | - | - | 2,493 | 14,111 | 305 | 462 | 23 | 23 | - | - | 203 | 14,799 |
| | GV-7 | - | - | 4,755 | 20,587 | 876 | 1,277 | 61 | 134 | - | - | 948 | 22,946 |
| | GV-8 | - | - | 1,410 | 5,022 | 146 | 207 | 12 | 12 | - | - | 255 | 5,496 |
| | GV-9 | - | - | 1,001 | 10,216 | 507 | 581 | 12 | 25 | - | - | 284 | 11,106 |
| April 23 | GV-10 | - | - | 69 | 849 | 426 | 2,025 | 3 | 399 | - | - | 3,738 | 7,011 |
| | GV-11 | - | - | 7,176 | 15,180 | 408 | 516 | 12 | 12 | - | - | 216 | 15,924 |
| | GV-12 | - | - | 578 | 1,496 | 64 | 134 | 0 | 0 | - | - | 161 | 1,791 |
| | GV-13 | - | - | 18 | 221 | 0 | 21 | 0 | 0 | - | - | 170 | 412 |
| | GV-14 | - | - | 217 | 737 | 36 | 99 | 3 | 3 | - | - | 81 | 920 |
| | GV-15 | - | - | 204 | 639 | 105 | 249 | 6 | 18 | - | - | 258 | 1,164 |
| | GV-16 | - | - | 129 | 507 | 75 | 165 | 24 | 45 | - | - | 69 | 786 |
| | GV-17 | - | - | 391 | 742 | 172 | 272 | 53 | 61 | - | - | 90 | 1,165 |
| | GV-18 | 0 | 0 | 341 | 468 | 176 | 204 | 0 | 0 | - | - | 25 | 697 |
| | GV-19 | 0 | 0 | 364 | 491 | 216 | 266 | 0 | 0 | - | - | 6 | 763 |
| | GV-20 | 3 | 3 | 99 | 225 | 102 | 172 | 0 | 0 | - | - | 38 | 438 |
| | GV-21 | 0 | 0 | 100 | 218 | 115 | 158 | 0 | 0 | - | - | 40 | 416 |
| | GV-22 | 0 | 0 | 76 | 124 | 65 | 115 | 0 | 0 | - | - | 79 | 318 |
| | GV-23 | 0 | 0 | 64 | 122 | 32 | 81 | 0 | 0 | - | - | 44 | 247 |
| | GV-24 | 3 | 9 | 3 | 18 | 12 | 50 | 0 | 0 | - | - | 9 | 86 |
| GV-25 | 0 | 6 | 3 | 12 | 0 | 13 | 0 | 0 | - | - | 66 | 97 | |
| Total | | 6 | 18 | 27,868 | 85,574 | 18,774 | 25,220 | 2,242 | 3,427 | - | - | 8,094 | 122,333 |

¹ See text page

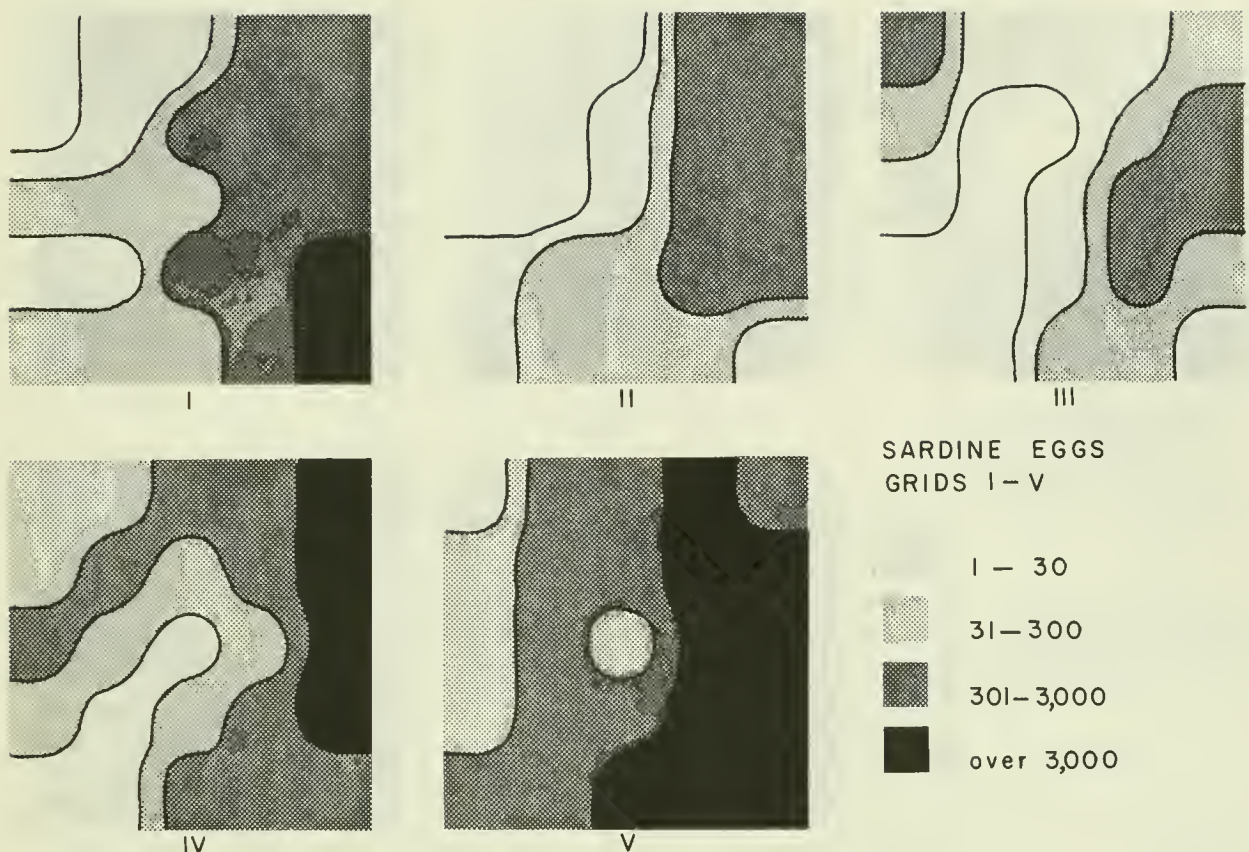


Figure 2. Sardine eggs: distribution and relative abundance on Grids 1 - V, April 18-23, 1952.

species (anchovy, jack mackerel, Pacific mackerel, hake, and rockfish) were relatively few in numbers (table 3). Tables 4 through 7 are records of all hauls containing larvae of sardine, anchovy, jack mackerel, and Pacific mackerel reported by numbers per size class per station. Tables 8 and 9 are records of all hauls containing hake and rockfish larvae reported by numbers per station.

Noncommercial species of fish larvae (table 3) were best represented by the deep-sea smelt, *Leuroglossus stilbius*, and the lanternfish, *Lampanyctus mexicanus*, which together accounted for about 80 percent of "other fish larvae" collected on the grid, dredge, and anchor stations. These are reported by numbers per station in tables 10 and 11. The distribution diagrams for these larvae on the grids (figs. 4 and 5) show that the greater numbers were usually located offshore. This may indicate one of two types of distribution: First, that each of these species was normally

greater in numbers offshore (as the sardine larvae were inshore, fig. 3); or second, that these greater offshore numbers were an indication of diurnal migration of the larvae that made them more available to the net at night, as in the case of other plankton discussed below. The latter seems more probable in view of the findings of Ahlstrom (1959) who reported that these two species showed evidence of diurnal migration in replicate (day and night) vertical distribution series. He found that 5.0 times as many *Leuroglossus stilbius* larvae and 3.6 times as many *Lampanyctus mexicanus* larvae were caught by night as by day.

Differences in day and night collections on the grid stations were determined by weighting the numbers of larvae per haul in the daily collections and finally by 5-day ratios based on larvae per haul for all groups of data; five grids and 5 days each on dredge and anchor stations. Each grid was divided into night

Table 3.--Fish larvae collected at all grid-survey stations.

| Larvae | <u>Drogue</u> | | <u>Anchor</u> | | <u>Grid I</u> | | <u>Grid II</u> | |
|--------------------------------------------------------------------------------------------------------|---------------|---------|---------------|---------|---------------|---------|----------------|---------|
| | N | Percent | N | Percent | N | Percent | N | Percent |
| Sardine | 10,199 | 81.32 | 12,316 | 78.75 | 23,847 | 82.30 | 9,944 | 67.46 |
| Anchovy | 28 | 0.22 | 48 | 0.31 | 113 | 0.39 | 113 | 0.77 |
| Jack mackerel | 250 | 1.99 | 234 | 1.50 | 350 | 1.21 | 316 | 2.14 |
| Pacific mackerel | 71 | 0.57 | 40 | 0.26 | 221 | 0.76 | 57 | 0.39 |
| Hake | 128 | 1.02 | 283 | 1.81 | 323 | 1.11 | 256 | 1.74 |
| Rockfish | 49 | 0.39 | 191 | 1.22 | 110 | 0.38 | 138 | 0.94 |
| Other fish larvae (including: <i>Leuroglossus stilbius</i> and <i>Lampanyctus mexicanus</i>) | 1,817 | 114.49 | 2,527 | 16.16 | 4,010 | 13.84 | 3,916 | 26.57 |
| Total | 12,542 | 100.00 | 15,639 | 100.01 | 28,974 | 99.99 | 14,740 | 100.01 |
| <i>Leuroglossus stilbius</i> | 676 | 5.39 | 1,008 | 6.45 | 1,577 | 5.44 | 1,235 | 8.38 |
| <i>Lampanyctus mexicanus</i> | 842 | 6.71 | 1,214 | 7.76 | 1,642 | 5.67 | 1,954 | 13.26 |

| Larvae | <u>Grid III</u> | | <u>Grid IV</u> | | <u>Grid V</u> | | Total | Percent of total fish Larvae |
|--------------------------------------------------------------------------------------------------------|-----------------|---------|----------------|---------|---------------|---------|--------|---------------------------------------|
| | N | Percent | N | Percent | N | Percent | | |
| Sardine | 3,937 | 47.54 | 1,105 | 26.09 | 1,050 | 29.38 | 62,398 | 70.92 |
| Anchovy | 74 | 0.89 | 61 | 1.44 | 18 | 0.50 | 455 | 0.52 |
| Jack mackerel | 180 | 2.17 | 61 | 1.44 | 21 | 0.59 | 1,412 | 1.60 |
| Pacific mackerel | 0 | 0 | 11 | 0.26 | 0 | 0 | 400 | 0.45 |
| Hake | 181 | 2.19 | 117 | 2.76 | 151 | 4.22 | 1,439 | 1.64 |
| Rockfish | 102 | 1.23 | 106 | 2.50 | 42 | 1.18 | 738 | 0.84 |
| Other fish larvae (including: <i>Leuroglossus stilbius</i> and <i>Lampanyctus mexicanus</i>) | 3,908 | 45.98 | 2,774 | 65.50 | 2,292 | 64.13 | 21,144 | 24.03 |
| Total | 8,282 | 100.00 | 4,235 | 99.99 | 3,574 | 100.00 | 87,986 | 100.00 |
| <i>Leuroglossus stilbius</i> | 1,084 | 13.09 | 927 | 21.89 | 738 | 20.64 | 7,245 | 8.23 |
| <i>Lampanyctus mexicanus</i> | 2,121 | 25.61 | 1,424 | 33.62 | 863 | 24.15 | 10,060 | 11.43 |

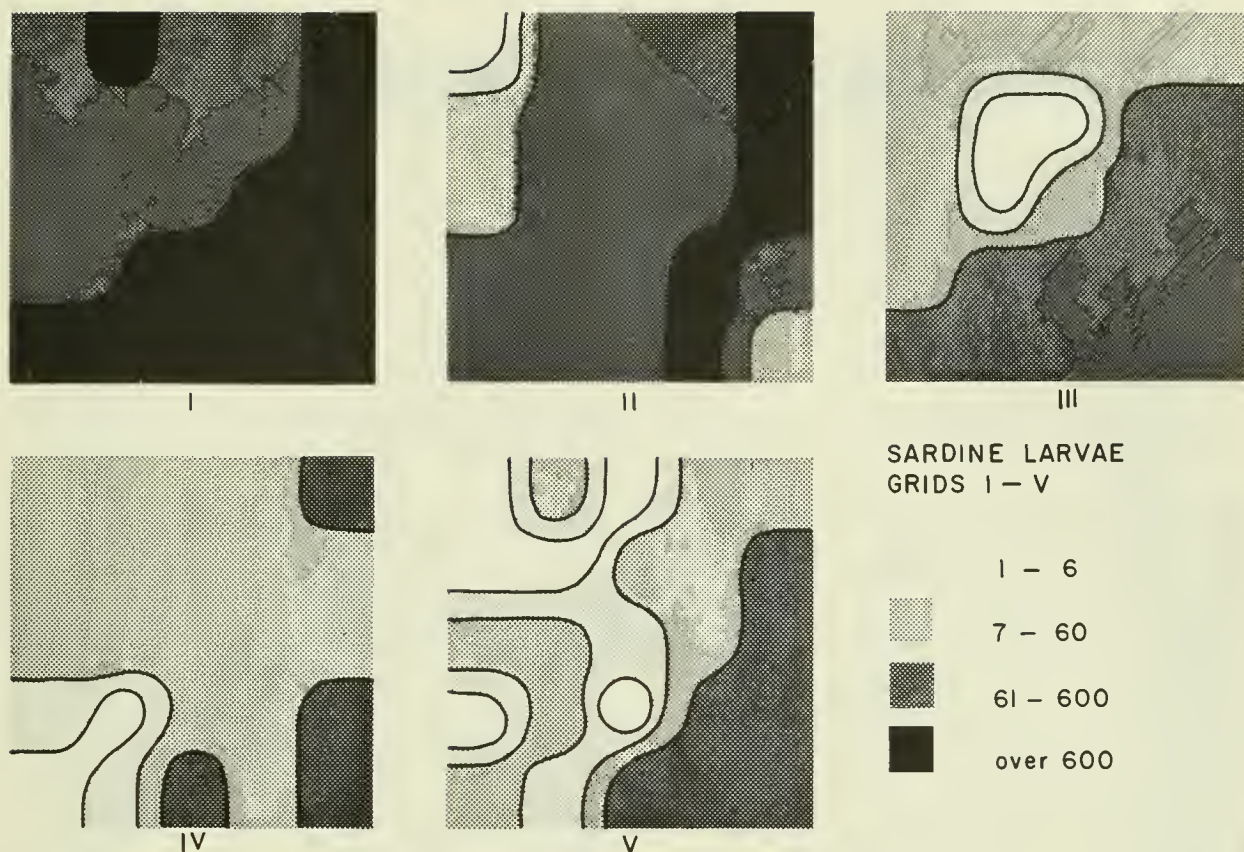


Figure 3. Sardine larvae: distribution and relative abundance on Grids I - V, April 18-23, 1952.

and day stations, omitting the ones occupied at or one-half hour before and after sunset (Ahlstrom, 1954b). Final ratios on the grids showed that 1.88 times as many *Leuroglossus stilbius* larvae and 2.66 times as many *Lampanyctus mexicanus* larvae were collected at night than in the day (table 12). Collections on drogue and anchor stations were either day or night; none were omitted. Five-day ratios of *Leuroglossus stilbius* larvae per haul showed 2.38 and 2.22 times as many collected at night as in the day on the drogue and anchor stations respectively (table 13). The 5-day ratios for *Lampanyctus mexicanus* larvae per haul on the drogue and anchor stations respectively showed 1.82 and 1.44 times as many collected at night as in the day (table 14).

PLANKTON VOLUMES

The plankton volumes reported in table 1 are based on milliliters of "wet" plankton per 1,000 cubic meters of water strained. The

procedures for measuring plankton were the same as those described in the reports on the annual collections by this laboratory already referred to above.

Relative concentrations of plankton volumes are depicted for the grids by light and heavy shading (fig. 6). The categories of these volumes are: (1) "very light", 33 ml. or less; (2) "light", 33-100 ml.; (3) "moderate", 100-300 ml.; (4) "heavy", 300-900 ml.; and (5) "very heavy", more than 900 ml. Histograms are used to show the plankton volumes of successive samples taken at drogue and anchor stations (fig. 7).

Plankton volumes in the grids were generally in the light category. When very light concentrations occurred they were usually in the eastern half of each day's pattern. Greater concentrations, in moderate to very heavy categories, usually occurred in the western sections. The exception was the fifth day when only two stations showed moderate plankton

Table 4.--Sardine larvae: numbers per size class per station

| Station | Midpoint of size class (in mm.) | | | | | | | | | | | | | | | | | Total |
|---------------|---------------------------------|---------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 3.0 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | |
| <i>Droque</i> | | | | | | | | | | | | | | | | | | |
| D-1 | | 21.6 | 5.4 | 2.7 | | | | | | | | | | | | | | 29.7 |
| D-2 | 25.7 | 112.4 | | | | | | | | | | | | | | | | 138.1 |
| D-3 | 7.8 | 70.2 | 33.8 | | 2.6 | | | | | | | | | | | | | 114.4 |
| D-4 | 4.4 | 87.2 | 130.8 | 8.8 | 6.6 | | | | | | | | | | | | | 237.8 |
| D-5 | 5.9 | 50.5 | 14.9 | | | | | | | | | | | | | | | 71.3 |
| D-6 | 28.8 | 259.2 | 69.1 | 11.5 | 5.8 | | | | | | | | | | | | | 374.4 |
| D-7 | 52.4 | 201.4 | 41.4 | 2.8 | | | | | | | | | | | | | | 298.0 |
| D-8 | 34.7 | 185.8 | 94.6 | 6.4 | 6.3 | 3.2 | | | | | | | | | | | | 331.0 |
| D-9 | 19.0 | 76.2 | 38.1 | | 2.7 | | | | | | | | | | | | | 136.0 |
| D-10 | 32.6 | 74.0 | 32.6 | 20.7 | 3.0 | | | | | | | | | | | | | 162.9 |
| D-11 | 46.7 | 284.9 | 79.5 | 2.7 | 5.5 | 2.7 | | | | | | | | | | | | 422.0 |
| D-12 | No sample | | | | | | | | | | | | | | | | | |
| D-13 | | 286.2 | 31.8 | 3.2 | 3.2 | | | | | | | | | | | | | 384.8 |
| D-14 | 81.9 | 246.0 | 65.6 | 19.7 | 6.6 | 3.3 | | | | | | | | | | | | 423.1 |
| D-15 | 84.6 | 624.0 | 256.7 | 26.0 | 9.7 | | | | | | | | | | | | | 1,001.0 |
| D-16 | 97.5 | 565.5 | 529.7 | 65.0 | 39.0 | 26.0 | 13.0 | | | | | | | | | | | 1,335.7 |
| D-17 | 90.5 | 528.5 | 170.2 | 32.6 | 10.9 | 3.6 | 7.2 | 3.6 | 3.6 | | | | | | | | | 850.7 |
| D-18 | 33.4 | 607.9 | 414.1 | 70.1 | 43.4 | 3.1 | 10.0 | 6.7 | | | | | | | | | | 1,185.6 |
| D-19 | 28.0 | 152.4 | 99.5 | 6.2 | 6.2 | 3.1 | 3.1 | | | | | | | | | | | 298.5 |
| D-20 | 9.1 | 42.7 | 27.5 | | | 3.0 | | | | | | | | | | | | 82.3 |
| D-21 | 37.6 | 238.6 | 72.2 | 25.1 | | | 6.3 | 3.1 | | | | | | | | | | 382.9 |
| D-22 | 21.8 | 109.2 | 103.0 | 25.0 | 9.4 | 9.4 | 3.1 | 3.1 | | | 3.1 | | | | | | | 287.1 |
| D-23 | 53.6 | 46.9 | 23.4 | 16.7 | 10.1 | 10.1 | 3.4 | 3.4 | 6.8 | | 3.4 | | | | | | | 177.8 |
| D-24 | 40.6 | 115.4 | 46.8 | 18.8 | 15.6 | 3.1 | 12.4 | 12.5 | 9.3 | 3.1 | | | | | | | | 280.7 |
| D-25 | 3.6 | 99.4 | 60.3 | 14.2 | 3.6 | 10.7 | | | | | | | | | | | | 191.8 |
| D-26 | 28.8 | 25.6 | | 3.2 | | | | | | | | | | | | | | 57.6 |
| D-27 | 6.3 | 37.8 | 34.6 | 18.8 | 9.5 | 12.6 | | | | | | | | | | | | 119.6 |
| D-28 | 4.0 | 39.6 | 59.4 | 59.4 | 67.3 | 27.8 | 39.6 | 23.7 | 11.9 | 7.9 | | 4.0 | | | 4.0 | | | 348.6 |
| D-29 | | 37.2 | 18.6 | 44.1 | 30.2 | 20.9 | 23.2 | 23.2 | 9.2 | 13.9 | 13.9 | 6.9 | | 2.3 | | | | 243.6 |
| D-30 | | 17.2 | 51.4 | 65.2 | 30.9 | 20.6 | 10.3 | 10.3 | 6.9 | 10.3 | 3.4 | | | | 3.4 | | | 229.9 |
| Total | 939.7 | 5,243.5 | 2,605.0 | 568.9 | 328.1 | 160.1 | 131.6 | 89.6 | 47.7 | 35.2 | 17.3 | 17.4 | 3.1 | 2.3 | 7.4 | | | 10,196.9 |
| <i>Anchor</i> | | | | | | | | | | | | | | | | | | |
| A-1 | 495.3 | 92.2 | 28.8 | 5.8 | 5.8 | | | | | | | | | | | | | 627.9 |
| A-2 | 712.9 | 162.6 | 48.4 | 6.9 | 10.4 | | | | 3.5 | | | | | | | | | 951.7 |
| A-3 | 240.3 | 237.3 | 14.6 | 5.8 | | | 7.0 | | | | | | | | | | | 498.0 |
| A-4 | 296.0 | 290.0 | 46.9 | 23.5 | 2.9 | 2.9 | 5.9 | 5.8 | | | | | | | | | | 673.9 |
| A-5 | 399.3 | 103.0 | 19.4 | 16.1 | 3.2 | 19.3 | 3.2 | 3.2 | | | | | | | | | | 566.7 |
| A-6 | 102.3 | 186.0 | 18.6 | 6.2 | 15.5 | 15.5 | 3.1 | 6.2 | | | | | | | | | | 353.4 |
| A-7 | 348.4 | 1,002.3 | 45.6 | 10.7 | | 8.1 | | | | | | | | | | | | 1,415.1 |
| A-8 | 752.2 | 503.3 | 2.9 | 2.9 | | | | | | | | | | | | | | 1,261.3 |
| A-9 | 461.4 | 630.6 | 43.7 | | | | | | | | | | | | | | | 1,135.7 |
| A-10 | 302.1 | 210.9 | 42.8 | 17.1 | 11.4 | 5.7 | | | | | | | | | | | | 590.0 |
| A-11 | 243.5 | 246.5 | 95.1 | 8.9 | 5.9 | 3.0 | | | | | | | | | | | | 602.9 |
| A-12 | 422.0 | 363.4 | 104.7 | 21.6 | 6.2 | | | | | | | | | | | | | 917.9 |
| A-13 | 158.8 | 170.6 | 41.2 | 11.8 | 5.9 | | | | | | | | | | | | | 388.3 |
| A-14 | 45.9 | 63.1 | 28.7 | 17.2 | | | | | | | | | | | | | | 154.9 |

Table 4.---Sardine larvae: numbers per size class per station--Continued

| Station | Midpoint of size class (in mm.) | | | | | | | | | | | | | | | | | Total | |
|---------|---------------------------------|----------|---------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 3.0 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | | Dis. |
| Inchor | | | | | | | | | | | | | | | | | | | |
| A-15 | 6.3 | 15.7 | | 6.5 | | | | | | | | | | | | | | | 22.0 |
| A-16 | 3.3 | 16.3 | 12.7 | 6.4 | 12.7 | | | | | | | | | 3.3 | | | | | 29.4 |
| A-17 | 38.1 | 19.1 | | | | | | 6.4 | | | | | | 6.5 | | | | | 95.4 |
| A-18 | | 6.5 | 17.0 | | | | | | | | | | | | | | | | 19.5 |
| A-19 | 11.4 | 17.1 | 5.7 | | 5.7 | | | | | | | | | | | | | | 45.5 |
| A-20 | 11.3 | 11.3 | 29.4 | | | | | | | | | | | | | | | | 34.0 |
| A-21 | 35.4 | 53.0 | 29.4 | | | | | | | | | | | | | | | | 117.8 |
| A-22 | 15.9 | 15.9 | 26.5 | 26.5 | 15.9 | | | | | | | | | | | | | | 100.7 |
| A-23 | 19.6 | 59.0 | 39.3 | 49.2 | 19.7 | | | | | | | | | | | | | | 186.8 |
| A-24 | 15.7 | 26.2 | 136.2 | | 10.5 | | | | | | | | | | | | | | 282.9 |
| A-25 | 32.4 | | | 5.4 | | | | | | | | | | | | | | | 37.8 |
| A-26 | 168.5 | | 6.2 | 24.9 | 8.0 | | | | | | | | | | | | | | 199.6 |
| A-27 | 60.0 | 8.0 | 8.0 | 12.0 | 8.0 | | | | | | | | | | | | | | 96.0 |
| A-28 | 139.8 | 19.1 | 25.4 | 44.5 | 57.2 | 6.4 | | | | | | | | | | | | | 292.4 |
| A-29 | 178.2 | 3.1 | | 27.6 | 33.8 | 6.1 | 2.8 | 2.8 | | | | | 2.8 | | | | | | 248.8 |
| A-30 | 118.9 | 51.0 | 53.7 | 76.4 | 51.0 | 8.5 | | | | | | | | | | | | | 367.9 |
| Total | 5,835.2 | 4,583.1 | 948.0 | 528.2 | 281.7 | 75.5 | 22.0 | 24.4 | 3.5 | | | | 2.8 | 9.8 | | | | | 12,314.2 |
| Grid I | | | | | | | | | | | | | | | | | | | |
| GI-1 | 813.3 | 572.4 | 15.5 | 15.5 | | | | | | | | | 2.6 | | | | | | 1,434.8 |
| GI-2 | 411.7 | 249.9 | 71.0 | 28.4 | 14.2 | 15.5 | 2.8 | | | | | | | | | | | | 783.7 |
| GI-3 | 460.5 | 214.5 | 42.9 | 14.3 | 11.4 | 5.7 | 2.9 | | | | | | | | | | | | 752.2 |
| GI-4 | 519.1 | 780.1 | 58.0 | 72.5 | 14.5 | | 2.9 | | | | | | | | | | | | 1,447.1 |
| GI-5 | 717.9 | 717.9 | 77.3 | 14.3 | | 2.9 | 2.9 | | | | | | | | | | | | 1,533.2 |
| GI-6 | 102.5 | 243.7 | 11.1 | | | | | | | | | | | | | | | | 357.3 |
| GI-7 | 66.9 | 171.6 | 52.4 | 5.8 | 2.9 | | | | | | | | | | | | | | 299.6 |
| GI-8 | 1,326.2 | 1,682.3 | 194.6 | 32.9 | | | | | | | | | | | | | | | 3,236.0 |
| GI-9 | 1,095.9 | 564.8 | 53.4 | 53.4 | | | | | | | | | | | | | | | 1,767.5 |
| GI-10 | 1,673.1 | 669.3 | 154.4 | 25.7 | 25.7 | 25.7 | 2.8 | | | | 2.9 | | | | | | | | 2,576.8 |
| GI-11 | 646.8 | 770.0 | 58.8 | 14.0 | 28.0 | 16.8 | 2.8 | 2.8 | | | | | | | | | | | 1,540.0 |
| GI-12 | 369.4 | 344.1 | 11.3 | 5.6 | | 2.8 | 2.5 | | | | | | | | | | | | 736.0 |
| GI-13 | 17.4 | 151.8 | 54.8 | | 7.5 | 2.5 | 2.5 | | | | | | | | | | | | 239.0 |
| GI-14 | 17.3 | 422.4 | 42.0 | 7.4 | 7.4 | | 2.5 | | | | | | | | | | | | 499.0 |
| GI-15 | 105.6 | 202.9 | 11.1 | 8.4 | 5.6 | | 2.5 | | | | | | | | | | | | 333.6 |
| GI-16 | 288.9 | 368.0 | 56.6 | 33.9 | 22.6 | | 2.8 | | | | | | | | | | | | 752.8 |
| GI-17 | 106.9 | 219.2 | 95.9 | 49.3 | | 11.0 | | | | | | | | | | | | | 485.0 |
| GI-18 | 5.6 | 132.5 | 62.0 | 28.2 | 14.1 | 2.8 | 5.6 | | | | | | | | | | | | 250.8 |
| GI-19 | 22.9 | 860.9 | 120.1 | 34.3 | 34.3 | 22.9 | 11.4 | | | 2.9 | | | 2.9 | | | | | | 1,115.5 |
| GI-20 | 46.9 | 717.8 | 102.6 | 26.4 | 17.6 | | 8.8 | | | 2.9 | | | 2.9 | | | | | | 928.8 |
| GI-21 | 272.3 | 609.8 | 106.5 | 65.1 | 32.5 | 3.1 | 3.1 | 3.1 | | | | | | | | | | | 1,086.2 |
| GI-22 | 79.6 | 257.0 | 21.4 | 9.2 | 3.1 | 2.8 | | | | | | | | | | | | | 379.6 |
| GI-23 | 38.9 | 158.5 | 86.2 | 30.6 | 13.9 | 2.8 | | | | | | | | | | | | | 330.9 |
| GI-24 | 11.6 | 417.6 | 11.6 | 23.2 | | 5.8 | | | | | | | | | | | | | 469.8 |
| GI-25 | 51.1 | 261.3 | 153.4 | 34.1 | 11.4 | | | | | | | | | | | | | | 511.3 |
| Total | 9,248.3 | 11,760.3 | 1,724.9 | 632.5 | 266.7 | 126.0 | 51.0 | 8.7 | | 5.8 | 2.9 | 8.4 | 5.8 | | | 2.7 | 2.5 | | 23,846.5 |

Table 4.---Sardine larvae: numbers per size class per station--Continued

| Station | Midpoint of size class (in mm.) | | | | | | | | | | | | | | | | | Total | |
|----------|---------------------------------|---------|---------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| | 3.0 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | | Dis. |
| Grid II | | | | | | | | | | | | | | | | | | | |
| GII-1 | 17.8 | 20.7 | 5.9 | 14.8 | 3.0 | 3.0 | 3.0 | | | | | | | | | | | | 68.2 |
| GII-2 | 409.5 | 179.4 | 7.8 | | | | | | | | | | | | | | | | 596.7 |
| GII-3 | 389.7 | 1,861.5 | 146.6 | 46.6 | | | | | | | | | | | | | | | 2,444.4 |
| GII-4 | 196.7 | 410.6 | 44.9 | 13.8 | | 3.4 | | | | | | | | | | | | | 669.4 |
| GII-5 | 131.8 | 429.4 | 43.9 | 4.8 | | | | | | | | | | | | | | | 609.9 |
| GII-6 | 29.5 | 69.9 | 25.7 | | 3.7 | | | | | | | | | | | | | | 128.8 |
| GII-7 | 19.0 | 239.4 | 87.4 | 11.4 | | | | | | | | | | | | | | | 357.2 |
| GII-8 | 137.8 | 347.4 | 40.6 | 6.2 | 3.1 | | | | | | | | | | | | | | 535.1 |
| GII-9 | 246.7 | 513.8 | 77.7 | 16.9 | | | | | | | | | | | | | | | 858.5 |
| GII-10 | 500.9 | 670.9 | 22.1 | 15.8 | 6.3 | 6.4 | | 3.4 | | | | | | | | | | | 1,222.4 |
| GII-11 | 57.2 | 384.2 | 104.5 | 6.8 | 3.4 | 3.4 | | | | | | | | | | | | | 562.9 |
| GII-12 | 39.0 | 144.3 | 11.7 | 3.9 | 7.8 | 3.9 | | | | | | | | | | | | | 210.6 |
| GII-13 | 6.4 | 121.3 | 60.7 | 6.4 | 3.2 | | | | | | | | | | | | | | 198.0 |
| GII-14 | 13.2 | 29.7 | 49.5 | 19.3 | 6.6 | | 3.3 | | | | | | | | | | | | 121.6 |
| GII-15 | 6.9 | 62.3 | 10.4 | | | | | | | | | | | | | | | | 79.6 |
| GII-16 | 3.4 | 51.8 | 3.4 | 3.4 | | | | | | | | | | | | | | | 62.0 |
| GII-17 | 13.2 | 66.0 | 9.9 | 9.9 | | | | | | | | | | | | | | | 99.0 |
| GII-18 | | 77.0 | 61.6 | 27.0 | 3.8 | | | | | | | | | | | | | | 169.4 |
| GII-19 | 12.6 | 106.8 | 53.4 | 34.6 | 22.0 | | | | | | | | | | | | | | 229.4 |
| GII-20 | 16.3 | 104.3 | 35.9 | 16.3 | 6.5 | 3.3 | | | | 3.3 | | | | | | | | | 185.9 |
| GII-21 | 77.8 | 110.6 | 24.0 | 18.0 | 6.0 | 3.0 | 3.0 | 3.0 | | | | | | | | | | | 245.4 |
| GII-22 | 6.4 | 51.5 | 96.6 | 19.3 | 9.6 | 9.6 | 3.2 | | | | | | | | | | | | 196.2 |
| GII-23 | 3.4 | 41.1 | 10.2 | 3.4 | | | | | | | | | | | | | | | 58.1 |
| GII-24 | 3.4 | 20.4 | 10.2 | 3.4 | | | | | | | | | | | | | | | 37.4 |
| GII-25 | | | | | | | | | | | | | | | | | | | |
| Total | 2,338.6 | 6,114.3 | 1,044.6 | 302.0 | 85.0 | 39.4 | 12.5 | 6.4 | | 3.3 | | | | | | | | | 9,946.1 |
| Grid III | | | | | | | | | | | | | | | | | | | |
| GIII-1 | 375.3 | 534.6 | 13.5 | 8.1 | 2.7 | | | | | | | | | | | | | | 934.2 |
| GIII-2 | 145.8 | 111.5 | 22.9 | 5.8 | | | | | | | | | | | | | | | 286.0 |
| GIII-3 | 347.1 | 136.8 | 18.5 | 2.6 | | 2.6 | | | | | | | | | | | | | 507.6 |
| GIII-4 | 30.0 | 29.9 | 6.0 | | | | | | | | | | | | | | | | 65.9 |
| GIII-5 | 11.3 | 25.4 | | 2.8 | | | | | | | | | | | | | | | 39.5 |
| GIII-6 | | 11.8 | 2.9 | | | | | | | | | | | | | | | | 14.7 |
| GIII-7 | 8.7 | 26.1 | 29.0 | 2.9 | | 2.9 | | | | | | | | | | | | | 69.6 |
| GIII-8 | 52.4 | 35.0 | 26.2 | | 2.9 | | | | | | | | | | | | | | 119.4 |
| GIII-9 | 251.8 | 153.5 | 3.1 | | | | | | | | 2.9 | | | | | | | | 408.4 |
| GIII-10 | 188.9 | 169.2 | 17.0 | 2.8 | | | | | | | | | | | | | | | 377.9 |
| GIII-11 | 152.6 | 98.7 | 74.8 | 15.0 | 3.0 | | 3.0 | | | | | | | | | | | | 347.1 |
| GIII-12 | 68.9 | 80.4 | 43.1 | 11.4 | 8.6 | 2.9 | | | | | | | | | | | | | 215.3 |
| GIII-13 | 8.7 | 17.4 | 17.4 | 5.8 | | | | | | | | | | | | | | | 49.3 |
| GIII-14 | No sample | | | | | | | | | | | | | | | | | | |
| GIII-15 | 2.8 | 33.2 | 8.3 | 2.8 | 5.5 | | | | | | | | | | | | | | 52.6 |
| GIII-16 | 5.6 | 5.6 | | 2.8 | | | | | | | | | | | | | | | 14.0 |
| GIII-17 | | | | | | | | | | | | | | | | | | | |
| GIII-18 | | | | | | | | | | | | | | | | | | | |
| GIII-19 | | 43.5 | 14.5 | 14.5 | 5.8 | | 2.9 | | | | | | | | | | | | 81.2 |

Table 4.--Sardine larvae: numbers per size class per station--Continued

| Station | Midpoint of size class (in mm.) | | | | | | | | | | | | | | | Dis. | Total |
|-----------------|---------------------------------|---------|-------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| | 3.0 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 |
| Grid III | | | | | | | | | | | | | | | | | |
| GIII-20 | 11.7 | 32.3 | 26.4 | 29.4 | 20.6 | 5.9 | 5.8 | | | | | | | | | | 132.1 |
| GIII-21 | | 69.0 | 13.8 | 8.3 | 8.3 | 2.8 | | | | | | | | | | | 102.2 |
| GIII-22 | | 14.3 | 2.9 | 2.9 | | 2.9 | | | | | | | | | | 2.9 | 28.8 |
| GIII-23 | | 47.3 | 3.0 | 6.0 | | | | | | | | | | | | | 56.3 |
| GIII-24 | | 3.0 | 3.0 | | 12.0 | 3.0 | | | | | | | | | | | 21.0 |
| GIII-25 | | 3.0 | | 5.9 | 3.0 | | | | | | | | | | | | 11.9 |
| Total | 1,661.6 | 1,681.5 | 346.3 | 129.8 | 72.4 | 23.0 | 11.7 | | 2.9 | | | | | 2.9 | | 2.9 | 3,935.0 |
| Grid IV | | | | | | | | | | | | | | | | | |
| GIV-1 | 35.8 | 68.8 | 25.5 | 7.7 | 5.8 | | | | | | | | | | | | 137.8 |
| GIV-2 | 17.4 | 40.5 | 17.3 | | | | | | | | | | | | | | 81.0 |
| GIV-3 | 6.8 | 13.6 | 6.8 | | | | | | | | | | | | | | 27.2 |
| GIV-4 | 12.0 | | 29.8 | 6.0 | 6.4 | 3.2 | | | | | | | | | | | 47.8 |
| GIV-5 | 19.0 | 19.0 | 69.8 | 53.9 | | | | | | | | | | | | | 171.3 |
| GIV-6 | 3.2 | 25.5 | 22.4 | 3.2 | | | | | | | | | | | | | 57.5 |
| GIV-7 | 6.1 | 21.3 | 18.2 | 3.0 | | | | | | | | | | | | | 48.6 |
| GIV-8 | 6.8 | 10.1 | | 13.5 | | | | | | | | | | | | | 30.4 |
| GIV-9 | 9.6 | 9.6 | 3.2 | | | | | | | | | | | | | | 22.4 |
| GIV-10 | 26.2 | 26.2 | 6.5 | | | | | | | | | | | | | | 58.9 |
| GIV-11 | 68.2 | 98.9 | 17.0 | 10.2 | 10.2 | | | | | | | | | | | | 204.5 |
| GIV-12 | 18.0 | 10.8 | 10.8 | | | | | | | | | | | | | | 50.4 |
| GIV-13 | 3.5 | 17.7 | | | 3.4 | | | | | | | | | | | | 21.2 |
| GIV-14 | | 6.8 | | | | | 3.4 | | | | | | | | | | 13.6 |
| GIV-15 | 11.2 | | | | | | | | | | | | | | | | 11.2 |
| GIV-16 | 22.9 | 11.5 | | 3.8 | | | | | | | | | | | | | 38.2 |
| GIV-17 | 17.4 | | 3.5 | 3.4 | | 3.4 | | | | | | | | | | | 20.9 |
| GIV-18 | 3.4 | | | | | | | | | | | | | | | | 10.2 |
| GIV-19 | | | | | | | | | | | | | | | | | |
| GIV-20 | 3.3 | | | | | | | | | | | | | | | | 3.3 |
| GIV-21 | | | | | | | | | | | | | | | | | |
| GIV-22 | | | | | | | | | | | | | | | | | 3.4 |
| GIV-23 | 3.4 | | 3.2 | 6.4 | | | | | | | | | | | | | 9.6 |
| GIV-24 | | 3.3 | 16.8 | 10.1 | | | 3.3 | | | | | | | | | | 6.6 |
| GIV-25 | 3.4 | | | | | | | | | | | | | | | | 30.3 |
| Total | 297.6 | 383.6 | 250.8 | 132.0 | 25.8 | 6.6 | 6.7 | | | | | | | | | | 1,106.3 |
| Grid V | | | | | | | | | | | | | | | | | |
| GV-1 | 60.9 | 38.8 | 16.6 | | 16.6 | | | | | | | | | | | | 132.9 |
| GV-2 | 44.8 | | 22.4 | | 22.4 | | | | | | | | | | | | 89.6 |
| GV-3 | 56.4 | 16.9 | | | 5.6 | | | | | | | | | | | | 78.9 |
| GV-4 | 23.1 | 23.1 | 5.8 | 17.4 | 11.6 | 3.0 | | | | | | | | | | | 81.0 |
| GV-5 | 35.6 | 8.9 | | | 5.9 | | | | | | | | | | | | 53.4 |
| GV-6 | 33.9 | | 11.3 | | | | | | | | | | | | | | 45.2 |
| GV-7 | 12.2 | 24.3 | 12.2 | | | | | | | | | | | | | | 48.7 |
| GV-8 | | 12.2 | | | | | | | | | | | | | | | 12.2 |
| GV-9 | 55.7 | 6.2 | 24.7 | 12.4 | 6.2 | | | | | | | | | | | | 105.2 |

Table 4.--Sardine larvae: numbers per size class per station--Continued

| Station | Midpoint of size class (in mm.) | | | | | | | | | | | | | | | | | Total | |
|---------|---------------------------------|-------|-------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| | 3.0 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | | Dis. |
| Grid ↓ | | | | | | | | | | | | | | | | | | | |
| GV-10 | 99.0 | 12.0 | 6.0 | 6.0 | | | | | | | | | | | | | | | 114.0 |
| GV-11 | | 12.0 | 96.0 | 24.0 | | | | | | | | | | | | | | | 132.0 |
| GV-12 | | | | | | | | | | | | | | | | | | | |
| GV-13 | 6.0 | | | | | | | | | | | | | | | | | | 6.0 |
| GV-14 | 6.0 | 3.0 | | | | | | | | | | | | | | | | | 9.0 |
| GV-15 | | | | | | | | | | | | | | | | | | | |
| GV-16 | 21.0 | | 3.0 | | | 6.0 | | 3.0 | | | | | | | | | | | 33.0 |
| GV-17 | | | | | | | | | | | | | | | | | | | |
| GV-18 | 5.5 | 16.6 | | | 2.8 | | | | | | | | | | | | | | 24.9 |
| GV-19 | 8.9 | 17.8 | 3.0 | | | | | | | | | | | | | | | | 29.7 |
| GV-20 | | | | | | | 2.9 | | | | | | | | | | | | 2.9 |
| GV-21 | 2.9 | | | 2.9 | 14.3 | | | | | | | | | | | | | | 20.1 |
| GV-22 | | | | | | | | | | | | | | | | | | | |
| GV-23 | 11.6 | 5.8 | | | | | | | | | | | | | | | | | 17.4 |
| GV-24 | | | | | | | | | | | | | | | | | | | |
| GV-25 | | | | | | | | | | | | | | | | | | | |
| Total | 474.5 | 197.6 | 201.0 | 62.7 | 85.4 | 11.9 | | 3.0 | | | | | | | | | | | 1,036.1 |

TABLE 5.--Anchovy: numbers per size class per station

| Station | Mid-Point of size class (in mm.) | | | | | | | | | | | | | | | | | | | Total |
|---------|----------------------------------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2.5 | 3.75 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dis. | |
| Drogue | No sample | | | | | | | | | | | | | | | | | | | |
| D-11 | | | 2.7 | 2.7 | | | | 2.7 | | 3.3 | | | | | | | | | 2.7 | 10.8 |
| D-12 | | | | | | | | | 3.1 | | | | | | | | | | | 3.3 |
| D-18 | | | | | 3.2 | | | | 4.0 | 4.0 | | | | | | | | | | 3.1 |
| D-19 | | | | | | | | | | | | | | | | | | | | 3.2 |
| D-27 | | | | | | | | | | | | | | | | | | | | 8.0 |
| D-28 | | | | | | | | | | | | | | | | | | | | |
| Total | | | 2.7 | 5.9 | | | | 9.8 | 4.0 | 3.3 | | | | | | | | 2.7 | 28.4 | |
| Anchor | | | | | | | | | | | | | | | | | | | | |
| A-4 | | | | | | | 2.9 | | | | | | | | 2.9 | | | | 5.8 | |
| A-5 | | | | | | 3.2 | | 3.1 | | 2.7 | | | | | | | | | 3.2 | |
| A-6 | | | | | | | | | | | | | | | | | | | 3.1 | |
| A-7 | | | | | | | | | | | | | | 3.0 | | | | | 2.7 | |
| A-11 | | | | | | | | | | | | | | | | | | | 3.0 | |
| A-12 | | | | | | | | | 3.1 | 3.1 | | | | | | | | | 6.2 | |
| A-16 | | | | | | | | | | 6.5 | | | | | | | | | 13.0 | |
| A-24 | | | | | | | | | | | | | | | | 5.2 | | | 5.2 | |
| A-30 | | | | 2.8 | | | | | | 2.8 | | | | | | | | | 5.6 | |
| Total | | | 2.8 | | 9.7 | 2.9 | 3.1 | 3.1 | 15.1 | | | | 3.0 | 2.9 | 5.2 | | | | 47.8 | |
| Grid I | | | | | | | | | | | | | | | | | | | | |
| GI-2 | | | | | | | | | | | | | | | | | | | 2.8 | |
| GI-17 | | | | | | 2.8 | 2.7 | 8.2 | 2.7 | 2.7 | 2.7 | 2.7 | | 2.7 | | | | | 24.4 | |
| GI-18 | | | | | | | | 2.8 | | 2.8 | | | | | | | | | 5.6 | |
| GI-20 | | | | | | | | 2.9 | | 2.9 | | | | | | | | | 5.8 | |
| GI-21 | | | | | | | 3.0 | | | | | | | | | | | | 9.0 | |
| GI-22 | | 3.0 | | 3.0 | | | 9.2 | 6.1 | 3.1 | 3.1 | | | | | | | 6.2 | | 27.7 | |
| GI-23 | | | | | 5.6 | | 5.6 | 2.8 | | | | | | | | | | | 22.3 | |
| GI-24 | | | | | | | | | 5.8 | | | | | | | | | | 5.8 | |
| GI-25 | | | | | | 2.8 | | | 2.8 | | | 2.8 | | | | | | | 8.4 | |
| Total | | 3.0 | 11.3 | 5.6 | 5.6 | 20.5 | 22.8 | 14.4 | 11.5 | 2.7 | 5.5 | | 2.7 | | | 6.2 | | | 111.8 | |
| Grid II | | | | | | | | | | | | | | | | | | | | |
| GII-1 | | | | | | | | | | | | | | | | | | | 6.0 | |
| GII-6 | | | | | | | | | 6.0 | | | | | | | | | | 3.7 | |
| GII-11 | | | | | 3.4 | | | | | | | | | | | | | | 3.4 | |
| GII-15 | | | | | | | | 3.5 | 3.5 | 3.5 | | | 3.5 | | | | | | 14.0 | |
| GII-16 | | | | | | | | | 3.5 | 3.5 | | | | | | | | | 7.0 | |
| GII-17 | | | | | | | | | 3.3 | | | | | | | | | | 3.3 | |
| GII-18 | | | | | | | | 3.9 | | | | | | | | | | | 15.6 | |
| GII-19 | | | | | 3.9 | 3.9 | | | 3.1 | | 3.1 | | | | | | | | 9.3 | |
| GII-20 | | | | | | | | | | | | | | | | | | | 3.3 | |
| GII-21 | | | | | | | 3.0 | | | | 3.0 | | | | 3.3 | | | 9.0 | | |
| GII-22 | | | | | | | | 3.2 | 3.2 | | | | | | 3.0 | | | 22.4 | | |
| GII-24 | | 3.4 | 3.2 | 3.2 | 6.4 | 3.2 | | 10.2 | | | | | | | | | | 13.6 | | |
| Total | | 3.4 | 7.1 | 10.5 | 17.1 | 3.2 | 10.4 | 32.8 | 10.2 | 3.1 | 3.0 | 3.5 | | | 6.3 | | | | 110.6 | |

TABLE 5.--Anchovy: numbers per size class per station--Continued

| Station | Mid-point of size class (in mm.) | | | | | | | | | | | | | | | | | | | | |
|----------|----------------------------------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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| | 2.5 | 3.75 | 4.75 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dis | Total | |
| Grid III | | | | | | | | | | | | | | | | | | | | | |
| GIII-9 | No sample | | | 3.0 | | | | | 3.1 | | | | | | | | | | | 3.1 3.0 | |
| GIII-11 | | | | | | | | | | | | | | | | | | | | | |
| GIII-14 | | | | | | | | | | | | | | | | | | | | | |
| GIII-16 | | 5.6 | 5.6 | 2.8 | | | | | | | | 2.8 | | | | | | | | | 14.0 11.2 5.8 2.8 5.8 15.0 21.0 12.0 |
| GIII-17 | | | | | | | | | | | | | | | | | | | | | |
| GIII-20 | | | | 2.9 | | | | | | | | | | | | | | | | | |
| GIII-21 | | | | | | | 2.9 | | | | | | 2.8 | | | | | | | | |
| GIII-22 | | | | | | | 6.0 | | 3.0 | | | | | | | 2.9 | | | | | |
| GIII-23 | | | | | | | 12.0 | 3.0 | | | | | 3.0 | | | 3.0 | | | | | |
| GIII-24 | | | 3.0 | 3.0 | | | 3.0 | | 3.0 | | | | | | | | 3.0 | | | | |
| GIII-25 | | | | | | | | | | | | | | | | | | | | | |
| Total | | 5.6 | 8.6 | 6.0 | 5.7 | 23.8 | 6.0 | 3.0 | 6.1 | | 2.8 | 5.8 | | | 11.7 | 2.8 | 3.0 | 2.8 | | 93.7 | |
| Grid II | | | | | | | | | | | | | | | | | | | | | |
| GIV-2 | | 2.9 | | | | | | | 3.0 | | | | | | | | | | | 3.7 < | |

TABLE 6.--Jack mackerel larvae: numbers per size class per station

| Station | Mid-point of size class (in mm.) | | | | | | | | | | | | | | | | | | | | | | | Total |
|---------|----------------------------------|------|-------|------|-----|-----|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dia. | |
| Drogue | | | | | | | | | | | | | | | | | | | | | | | | |
| D-1 | 3.2 | | | | | | | | | | | | | | | | | | | | | | | 29.7 |
| D-2 | 2.6 | | | | | | | | | | | | | | | | | | | | | | | 3.2 |
| D-3 | 4.4 | 6.5 | 2.2 | | | | | | | | | | | | | | | | | | | | | 2.6 |
| D-4 | 3.0 | | | | | | | | | | | | | | | | | | | | | | | 13.1 |
| D-5 | 8.3 | | 2.8 | | | | | | | | | | | | | | | | | | | | | 3.0 |
| D-7 | | | 3.2 | | | | | | | | | | | | | | | | | | | | | 11.1 |
| D-8 | | | 3.0 | | | | | | | | | | | | | | | | | | | | | 3.2 |
| D-10 | | 3.0 | 2.7 | | | | | | | | | | | | | | | | | | | | | 6.0 |
| D-11 | 2.7 | | | | | | | | | | | | | | | | | | | | | | | 8.1 |
| D-12 | No sample | | | | | | | | | | | | | | | | | | | | | | | |
| D-13 | | | 3.2 | | | | | | | | | | | | | | | | | | | | | 3.2 |
| D-14 | 3.2 | | 12.7 | | | | | | | | | | | | | | | | | | | | | 15.9 |
| D-15 | 6.5 | | | | | | | | | | | | | | | | | | | | | | | 9.7 |
| D-16 | | 3.2 | 9.8 | | | | | | | | | | | | | | | | | | | | | 13.0 |
| D-17 | | 3.6 | 3.6 | | | | | | | | | | | | | | | | | | | | | 14.4 |
| D-18 | 3.6 | 3.3 | 20.0 | | | | | | | | | | | | | | | | | | | | | 43.3 |
| D-19 | | | 12.4 | | | | | | | | | | | | | | | | | | | | | 15.5 |
| D-21 | | 6.3 | 3.1 | | | | | | | | | | | | | | | | | | | | | 3.1 |
| D-22 | | | 3.1 | | | | | | | | | | | | | | | | | | | | | 10.1 |
| D-23 | | 3.4 | 6.7 | | | | | | | | | | | | | | | | | | | | | 9.3 |
| D-24 | | | | | | | | | | | | | | | | | | | | | | | | 7.1 |
| D-25 | | | | | | | | | | | | | | | | | | | | | | | | 6.4 |
| D-26 | | 6.4 | 3.2 | | | | | | | | | | | | | | | | | | | | | 15.8 |
| D-27 | | 9.4 | 3.2 | | | | | | | | | | | | | | | | | | | | | 19.8 |
| D-28 | | 4.0 | 15.8 | | | | | | | | | | | | | | | | | | | | | 2.3 |
| D-29 | | 2.3 | | | | | | | | | | | | | | | | | | | | | | 3.4 |
| D-30 | | | 3.4 | | | | | | | | | | | | | | | | | | | | | |
| Total | 37.5 | 57.3 | 110.9 | 36.6 | 6.4 | 3.3 | 24.7 | 5.4 | 2.7 | | | | | | | | | | | | | | | 284.8 |
| Anchor | | | | | | | | | | | | | | | | | | | | | | | | |
| A-6 | 3.1 | 3.1 | | 3.1 | | | | | | | | | | | | | | | | | | | | 9.3 |
| A-7 | 40.2 | 8.0 | | | | | | | | | | | | | | | | | | | | | | 48.2 |
| A-8 | 31.5 | 5.7 | | | | | | | | | | | | | | | | | | | | | | 37.2 |
| A-9 | 13.6 | 27.3 | 13.6 | | | | | | | | | | | | | | | | | | | | | 54.5 |
| A-10 | 5.7 | 2.8 | | | | | | | | | | | | | | | | | | | | | | 8.5 |
| A-11 | 5.9 | 8.9 | | | | | | | | | | | | | | | | | | | | | | 14.8 |
| A-12 | 3.1 | 9.2 | | | | | | | | | | | | | | | | | | | | | | 12.3 |
| A-14 | | | | | | | | | | | | | | | | | | | | | | | | 5.7 |
| A-20 | 11.3 | 5.7 | 5.7 | | | | | | | | | | | | | | | | | | | | | 17.0 |
| A-21 | 5.9 | | | | | | | | | | | | | | | | | | | | | | | 5.9 |
| A-27 | 8.0 | | | | | | | | | | | | | | | | | | | | | | | 8.0 |
| A-28 | 12.7 | | | | | | | | | | | | | | | | | | | | | | | 12.7 |
| Total | 141.0 | 70.7 | 19.3 | 3.1 | | | | | | | | | | | | | | | | | | | | 234.1 |
| Grid I | | | | | | | | | | | | | | | | | | | | | | | | |
| GI-4 | 5.8 | | | | 2.9 | | | | | | | | | | | | | | | | | | | 8.7 |
| GI-5 | 8.6 | 2.9 | 5.7 | | | | | | | | | | | | | | | | | | | | | 17.2 |

TABLE 6.--Jack mackerel larvae: numbers per size class per station--Continued

| Station | Mid-point of size class (in mm.) | | | | | | | | | | | | | | | | | | | | | | | Total | |
|----------|----------------------------------|-------|------|------|------|-----|-----|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dis. | | |
| Grid I | GI-6 | 8.3 | 5.5 | | | | | | | | | | | | | | | | | | | | | 13.8 | |
| | GI-7 | 14.6 | 2.9 | 5.8 | | | | | | | | | | | | | | | | | | | | 23.3 | |
| | GI-8 | 8.2 | 11.0 | 5.5 | | | | | | | | | | | | | | | | | | | | 24.7 | |
| | GI-9 | 8.4 | 2.8 | | | 5.6 | | | | | | | | | | | | | | | | | | 16.8 | |
| | GI-10 | | 2.9 | 2.9 | | | | | | | | | | | | | | | | | | | | 5.8 | |
| | GI-11 | 22.4 | 11.2 | | | 8.4 | | | | | | | | | | | | | | | | | | 42.0 | |
| | GI-13 | 5.0 | 5.0 | 5.0 | | | | | | | | | | | | | | | | | | | | 15.0 | |
| | GI-14 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | 5.0 | |
| | GI-16 | 5.7 | 8.5 | | | | | | | | | | | | | | | | | | | | | | 14.2 |
| | GI-17 | 5.5 | 16.4 | | | | | | | | | | | | | | | | | | | | | | 21.9 |
| | GI-19 | | 5.7 | 2.9 | | | | | | | | | | | | | | | | | | | | | 8.6 |
| | GI-20 | | 5.9 | 2.9 | | | | | | | | | | | | | | | | | | | | | 8.8 |
| GI-21 | 3.0 | 14.8 | 3.0 | | | | | | | | | | | | | | | | | | | | | 20.8 | |
| GI-22 | | 21.4 | 24.5 | | | | | | | | | | | | | | | | | | | | | 45.9 | |
| GI-23 | 5.6 | 16.7 | 22.2 | 5.6 | | | | | | | | | | | | | | | | | | | | 50.1 | |
| GI-25 | 5.7 | | | | | | | | | | | | | | | | | | | | | | | 5.7 | |
| Total | 109.3 | 136.1 | 80.4 | 5.6 | 16.9 | | | | | | | | | | | | | | | | | | | 348.3 | |
| Grid II | GI1-2 | 3.9 | | | | | | | | | | | | | | | | | | | | | | 3.9 | |
| | GI1-3 | 20.0 | 3.3 | 3.3 | 3.3 | | | | | | | | | | | | | | | | | | | 29.9 | |
| | GI1-4 | 6.9 | | | | | | | | | | | | | | | | | | | | | | 6.9 | |
| | GI1-5 | 4.9 | 14.6 | | | | | | | | | | | | | | | | | | | | | 19.5 | |
| | GI1-6 | 3.7 | 11.0 | | | | | | | | | | | | | | | | | | | | | 14.7 | |
| | GI1-7 | 3.8 | 11.4 | 3.8 | | | | | | | | | | | | | | | | | | | | 19.0 | |
| | GI1-8 | | 6.3 | | | | | | | | | | | | | | | | | | | | | 6.3 | |
| | GI1-9 | 3.4 | 23.7 | 33.8 | 6.8 | | | | | | | | | | | | | | | | | | | 67.7 | |
| | GI1-10 | 12.6 | 9.4 | | | 3.2 | | | | | | | | | | | | | | | | | | 25.2 | |
| | GI1-11 | 6.7 | 10.1 | 27.0 | | | | | | | | | | | | | | | | | | | | 43.8 | |
| | GI1-12 | | | 3.9 | | | | | | | | | | | | | | | | | | | | 3.9 | |
| | GI1-13 | | 9.4 | 6.3 | | | | | | | | | | | | | | | | | | | | 15.7 | |
| GI1-14 | | 3.3 | 3.3 | | | | | | | | | | | | | | | | | | | | 6.6 | | |
| GI1-15 | | 3.5 | | | | | | | | | | | | | | | | | | | | | 3.5 | | |
| GI1-16 | 3.4 | | | | | | | | | | | | | | | | | | | | | | 3.4 | | |
| GI1-19 | 3.1 | 6.3 | | | | | | | | | | | | | | | | | | | | | 9.4 | | |
| GI1-21 | 3.0 | 9.0 | | | | | | | | | | | | | | | | | | | | | 12.0 | | |
| GI1-22 | 3.2 | | 6.4 | | | | | | | | | | | | | | | | | | | | 9.6 | | |
| GI1-23 | 3.4 | 6.8 | | | | | | | | | | | | | | | | | | | | | 10.2 | | |
| GI1-24 | | | 3.4 | | | | | | | | | | | | | | | | | | | | 3.4 | | |
| Total | 82.0 | 128.1 | 91.2 | 10.1 | 3.2 | | | | | | | | | | | | | | | | | | | 314.6 | |
| Grid III | GI11-1 | 10.8 | 10.8 | 5.4 | | | | | | | | | | | | | | | | | | | | 27.0 | |
| | GI11-2 | | 2.9 | | | | | | | | | | | | | | | | | | | | | 2.9 | |
| | GI11-3 | 5.3 | 18.4 | 2.6 | | | | | | | | | | | | | | | | | | | | 26.3 | |
| | GI11-4 | 3.0 | 6.0 | | | | | | | | | | | | | | | | | | | | | 9.0 | |
| | GI11-5 | | 2.8 | | | | | | | | | | | | | | | | | | | | | 2.8 | |

TABLE 6.--Jack mackerel larvae: numbers per size class per station--Continued

| Station | Mid-Point of size class (in mm.) | | | | | | | | | | | | | | | | | | | | | | | Total | |
|----------|----------------------------------|------|------|-----|-----|-----|-----|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dia. | | |
| Grid III | | | | | | | | | | | | | | | | | | | | | | | | 2.9 | |
| | | 2.9 | | | | | | | | | | | | | | | | | | | | | | 2.9 | |
| | 2.9 | 2.9 | | | | | | | | | | | | | | | | | | | | | | 2.9 | |
| | | 3.1 | | | | | | | | | | | | | | | | | | | | | | 5.8 | |
| | | 2.8 | 2.8 | | | | | | | | | | | | | | | | | | | | | 3.1 | |
| | | 12.0 | | | | | | | | | | | | | | | | | | | | | | 5.6 | |
| | | 8.6 | | | | | | | | | | | | | | | | | | | | | | 21.0 | |
| | | 5.8 | 2.9 | | | | | | | | | | | | | | | | | | | | | 17.2 | |
| | No sample | | | | | | | | | | | | | | | | | | | | | | | 14.5 | |
| | | 2.8 | 5.8 | 5.8 | | | | | | | | | | | | | | | | | | | | | 2.8 |
| | | 2.9 | 14.7 | 2.8 | | | | | | | | | | | | | | | | | | | | | 11.6 |
| | 2.8 | | | | | | | | | | | | | | | | | | | | | | | 17.6 | |
| | | | | | | | | | | | | | | | | | | | | | | | | 5.6 | |
| Total | 48.2 | 87.6 | 37.0 | 5.8 | | | | | | | | | | | | | | | | | | | | 178.6 | |
| Grid IV | | | | | | | | | | | | | | | | | | | | | | | | | 7.6 |
| | 12.7 | | 7.6 | | | | | | | | | | | | | | | | | | | | | 15.9 | |
| | | | 3.2 | | | | | | | | | | | | | | | | | | | | | 3.2 | |
| | | | 12.6 | | | | | | | | | | | | | | | | | | | | | 15.7 | |
| | | 3.1 | | | | | | | | | | | | | | | | | | | | | | 7.2 | |
| | | 3.6 | | | | | | | | | | | | | | | | | | | | | | 7.0 | |
| | 3.5 | 3.5 | | | | | | | | | | | | | | | | | | | | | | 3.4 | |
| | 3.4 | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 16.2 | 13.6 | 26.6 | | | | | | 3.6 | | | | | | | | | | | | | | | 60.0 | |
| Grid V | | | | | | | | | | | | | | | | | | | | | | | | | 5.6 |
| | | 5.6 | | | | | | | | | | | | | | | | | | | | | | 3.0 | |
| | 3.0 | | | | | | | | | | | | | | 3.0 | | | | | | | | | 6.0 | |
| | 3.0 | | | | | | | | | | | | | | | | | | | | | | | 2.8 | |
| | | | 2.8 | | | | | | | | | | | | | | | | | | | | | 2.9 | |
| | | 2.9 | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 6.0 | 8.5 | 2.8 | | | | | | | | | | | 3.0 | | | | | | | | | | 20.3 | |

Table 7.--Pacific mackerel larvae: numbers per size class per station.

| Station | Mid-point of size class (in mm.) | | | | | | | | | | | | | | | | | | | | | | Total | |
|---------------|----------------------------------|-----|-------|------|------|-----|-----|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | | Dis. |
| <i>Progue</i> | | | | | | | | | | | | | | | | | | | | | | | | |
| D-11 | No sample. | | 2.7 | | | | | | | | | | | | | | | | | | | | | 2.7 |
| D-12 | | | | | 3.2 | | | | | | | | | | | | | | | | | | | 3.2 |
| D-16 | | | | | | | | | | | | | | | | | | | | | | | | 3.6 |
| D-17 | | | | 3.6 | 3.3 | | | | | | | | | | | | | | | | | | | 3.6 |
| D-18 | | | 2.3 | | | | | | | | | | | | | | | | | | | | | 6.6 |
| D-19 | | 3.1 | 12.4 | 3.1 | | | | | | | | | | | | | | | | | | | | 15.5 |
| D-21 | | | 9.4 | | | | | | | | | | | | | | | | | | | | | 12.5 |
| D-22 | | | 6.2 | | | | | | | | | | | | | | | | | | | | | 9.3 |
| D-23 | 3.1 | 3.4 | | | | | | | | | | | | | | | | | | | | | | 3.4 |
| D-28 | | | 7.9 | | | | | | | | | | | | | | | | | | | | | 7.9 |
| D-29 | | | 2.3 | | | | | | | | | | | | | | | | | | | | | 2.3 |
| D-30 | | | 3.4 | | | | | | | | | | | | | | | | | | | | | 3.4 |
| Total | 3.1 | 6.5 | 51.2 | 9.6 | | | | | | | | | | | | | | | | | | | | 70.4 |
| <i>Anchor</i> | | | | | | | | | | | | | | | | | | | | | | | | |
| A-5 | 3.2 | | 3.2 | | | | | 3.1 | | | | | | | | | | | | | | | | 6.4 |
| A-6 | | | | | | | | | | | | | | | | | | | | | | | | 3.1 |
| A-7 | | | 2.7 | 5.4 | | | | | | | | | | | | | | | | | | | | 8.1 |
| A-8 | | 2.9 | 2.9 | | | | | | | | | | | | | | | | | | | | | 5.8 |
| A-9 | | | 2.7 | | | | | | | | | | | | | | | | | | | | | 2.7 |
| A-20 | | | | 5.7 | | | | | | | | | | | | | | | | | | | | 5.7 |
| A-30 | 2.8 | 5.7 | | | | | | | | | | | | | | | | | | | | | | 8.5 |
| Total | 6.0 | 8.6 | 11.5 | 11.1 | | | | 3.1 | | | | | | | | | | | | | | | | 40.3 |
| <i>Grid I</i> | | | | | | | | | | | | | | | | | | | | | | | | |
| GI-2 | | | 5.7 | 11.4 | 5.7 | | | | | | | | | | | | | | | | | | | 22.8 |
| GI-4 | | | 2.9 | 11.6 | 2.9 | | | | | | | | | | | | | | | | | | | 17.4 |
| GI-5 | | | 2.9 | 5.7 | 5.7 | | | | | | | | | | | | | | | | | | | 14.3 |
| GI-7 | | | 14.6 | | | | | | | | | | | | | | | | | | | | | 14.6 |
| GI-8 | | | 16.4 | 5.5 | | | | | | | | | | | | | | | | | | | | 21.9 |
| GI-9 | | 2.8 | 14.0 | 19.6 | | | | | | | | | | | | | | | | | | | | 36.4 |
| GI-10 | | | 11.4 | 8.6 | | | | | | | | | | | | | | | | | | | | 20.0 |
| GI-11 | | | 5.6 | 8.4 | 5.6 | | | | | | | | | | | | | | | | | | | 22.4 |
| GI-12 | | 2.8 | 5.6 | 2.8 | 2.8 | | | | | | | | | | | | | | | | | | | 16.8 |
| GI-13 | 2.8 | 2.8 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | 5.0 |
| GI-19 | | | 8.6 | | | | | | | | | | | | | | | | | | | | | 8.6 |
| GI-23 | | | 5.6 | | | | | | | | | | | | | | | | | | | | | 5.6 |
| GI-24 | | | 11.6 | | | | | | | | | | | | | | | | | | | | | 11.6 |
| GI-25 | | | 2.8 | | | | | | | | | | | | | | | | | | | | | 2.8 |
| Total | 2.8 | 8.4 | 110.2 | 76.1 | 22.7 | | | | | | | | | | | | | | | | | | | 220.2 |

Table 7.--Pacific mackerel larvae: numbers per size class per station.--Continued

| Station | Mid-point of size class (in mm.) | | | | | | | | | | | | | | | Total | | | | | | | | |
|---------|----------------------------------|-----|------|------|-----|-----|-----|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.75 | 6.75 | 7.75 | 8.75 | 9.75 | 10.75 | 11.75 | 12.75 | | 13.75 | 14.75 | 15.75 | 17.25 | 19.25 | 21.25 | 23.25 | Dis. |
| Grid II | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 10.0 | 6.7 | 3.3 | | | | | | | | | | | | | | | | | | | 20.0 |
| | | | 4.9 | | | | | | | | | | | | | | | | | | | | | 4.9 |
| | | | | 3.1 | | | | | | | | | | | | | | | | | | | | 3.1 |
| | | | 6.3 | | 3.2 | 3.2 | | | | | | | | | | | | | | | | | | 15.9 |
| | | | | 3.4 | 3.4 | | | | | | | | | | | | | | | | | | | 10.2 |
| | | | 3.0 | | | | | | | | | | | | | | | | | | | | | 3.0 |
| Total | | | 24.2 | 13.2 | 9.9 | 3.2 | | 6.6 | | | | | | | | | | | | | | | | 57.1 |
| Grid IV | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 5.8 | 5.1 | | | | | | | | | | | | | | | | | | | | | 5.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | 5.8 |
| Total | | 5.8 | 5.1 | | | | | | | | | | | | | | | | | | | | | 10.9 |

Table 8.--Hake larvae, number per station

| Station | Drogue | Anchor | Grid I | Grid II | Grid III | Grid IV | Grid V |
|---------|-----------------|--------|--------|---------|-----------------|---------|--------|
| 1 | | | 10 | 3 | 5 | | 11 |
| 2 | 3 | 7 | 28 | 4 | 6 | 12 | |
| 3 | 3 | 6 | 26 | 16 | 13 | 7 | |
| 4 | 2 | 12 | 9 | 7 | 21 | | |
| 5 | | 6 | 6 | 5 | 20 | 19 | 3 |
| 6 | 3 | 6 | | 4 | 3 | 3 | |
| 7 | | 13 | 3 | 8 | | | 12 |
| 8 | 13 | 14 | 25 | 12 | 3 | 12 | |
| 9 | 3 | 11 | 11 | 7 | 12 | 3 | 12 |
| 10 | | 3 | 43 | 25 | | 17 | 15 |
| 11 | | 24 | 20 | 30 | 21 | 14 | 36 |
| 12 | NS ¹ | 15 | 11 | | 17 | 11 | 6 |
| 13 | 6 | 12 | 2 | 6 | 12 | | 6 |
| 14 | 3 | 6 | | 3 | NS ¹ | | 6 |
| 15 | 6 | | 8 | | | | |
| 16 | | 6 | 3 | 7 | | 8 | |
| 17 | 7 | | 6 | | 3 | 7 | |
| 18 | 3 | 13 | 3 | | | | |
| 19 | 12 | 23 | 14 | 25 | 6 | 3 | |
| 20 | 3 | 17 | 3 | 10 | 24 | 10 | 32 |
| 21 | 3 | 18 | 44 | 30 | 6 | | 3 |
| 22 | | 21 | 34 | 45 | 3 | | |
| 23 | 3 | | 11 | 3 | 3 | 3 | 3 |
| 24 | 3 | 5 | | 3 | 3 | | |
| 25 | 14 | 16 | 3 | | | | |
| 26 | 22 | 6 | - | - | - | - | - |
| 27 | | 4 | - | - | - | - | - |
| 28 | | 13 | - | - | - | - | - |
| 29 | 9 | | - | - | - | - | - |
| 30 | 7 | 6 | - | - | - | - | - |
| Total | 128 | 283 | 323 | 256 | 181 | 117 | 151 |

¹ No sampleTable 10.--*Leuroglossus stilbus* larvae, number per station

| Station | Drogue | Anchor | Grid I | Grid II | Grid III | Grid IV | Grid V |
|---------|-----------------|--------|--------|---------|-----------------|---------|--------|
| 1 | | 35 | 44 | 18 | 24 | 10 | 33 |
| 2 | 3 | 35 | 48 | 20 | 17 | 81 | 11 |
| 3 | 10 | 20 | 46 | 47 | 45 | 14 | |
| 4 | 15 | 38 | 110 | 38 | 54 | 12 | |
| 5 | 12 | 58 | 69 | 17 | 45 | 13 | 6 |
| 6 | 37 | 25 | 6 | 52 | 6 | 13 | 45 |
| 7 | 22 | 27 | 3 | 23 | 3 | 9 | 61 |
| 8 | 16 | 26 | 66 | 41 | 12 | 47 | 61 |
| 9 | 5 | 41 | 34 | | 31 | 6 | 37 |
| 10 | 18 | 26 | 157 | 82 | 25 | 72 | 15 |
| 11 | 16 | 54 | 64 | 17 | 75 | 55 | 12 |
| 12 | NS ¹ | 77 | 31 | 12 | 46 | 18 | 27 |
| 13 | 10 | 6 | 2 | 29 | 14 | 39 | 24 |
| 14 | 16 | 34 | 5 | 16 | NS ¹ | 41 | 24 |
| 15 | 6 | 3 | 6 | 42 | 61 | 49 | 18 |
| 16 | 42 | 46 | 91 | 83 | 65 | 15 | 54 |
| 17 | 43 | 44 | 115 | 59 | 78 | 31 | 23 |
| 18 | 53 | 39 | 34 | 142 | 112 | 54 | 11 |
| 19 | | 17 | 49 | 22 | 58 | 68 | 62 |
| 20 | 3 | 23 | 117 | 23 | 41 | 56 | 56 |
| 21 | 44 | 12 | 172 | 179 | 39 | 45 | 43 |
| 22 | 25 | 85 | 70 | 55 | 60 | 51 | 44 |
| 23 | 13 | 39 | 131 | 82 | 86 | 35 | 29 |
| 24 | 22 | 42 | 64 | 115 | 66 | 56 | 29 |
| 25 | 14 | 11 | 43 | 21 | 21 | 37 | 13 |
| 26 | 13 | 19 | - | - | - | - | - |
| 27 | 44 | 4 | - | - | - | - | - |
| 28 | 103 | 38 | - | - | - | - | - |
| 29 | 30 | 40 | - | - | - | - | - |
| 30 | 41 | 45 | - | - | - | - | - |
| Total | 676 | 1009 | 1577 | 1235 | 1084 | 927 | 738 |

¹ No sample

Table 9.--Rockfish larvae, number per station

| Station | Drogue | Anchor | Grid I | Grid II | Grid III | Grid IV | Grid V |
|---------|-----------------|--------|--------|---------|-----------------|---------|--------|
| 1 | 3 | 14 | | 36 | 27 | 15 | |
| 2 | | 21 | 11 | 20 | | 35 | |
| 3 | | 18 | 29 | 7 | | | 6 |
| 4 | | 26 | 9 | 7 | | 6 | |
| 5 | 3 | 19 | 3 | 2 | 6 | | |
| 6 | | 6 | 3 | 4 | 3 | 16 | |
| 7 | | | | 8 | 3 | 6 | 12 |
| 8 | | 3 | | | 9 | | |
| 9 | | 6 | | | 3 | | |
| 10 | 3 | | | 3 | 3 | | |
| 11 | | | | 7 | | 7 | |
| 12 | NS ¹ | | | 12 | | | 3 |
| 13 | 3 | | | | 6 | 4 | |
| 14 | | | 5 | | NS ¹ | | |
| 15 | 6 | 3 | | | 3 | | 3 |
| 16 | 3 | 6 | 6 | | 6 | 8 | |
| 17 | | | 6 | 10 | 3 | | 3 |
| 18 | 3 | 6 | 3 | | 3 | 3 | 6 |
| 19 | | 6 | 3 | | | | 6 |
| 20 | | | 23 | | | | |
| 21 | 3 | | 3 | 3 | 6 | | 3 |
| 22 | 3 | | | 3 | 6 | | |
| 23 | | | 3 | | | 3 | |
| 24 | | | | 3 | | 3 | |
| 25 | 7 | 16 | 3 | 3 | 3 | | |
| 26 | | | - | - | - | - | - |
| 27 | 9 | | - | - | - | - | - |
| 28 | | 32 | - | - | - | - | - |
| 29 | | 9 | - | - | - | - | - |
| 30 | 3 | | - | - | - | - | - |
| Total | 49 | 191 | 110 | 138 | 102 | 106 | 42 |

¹ No sampleTable 11.--*Lampanyctus mexicanus* larvae, number per station

| Station | Drogue | Anchor | Grid I | Grid II | Grid III | Grid IV | Grid V |
|---------|-----------------|--------|--------|---------|-----------------|---------|--------|
| 1 | 22 | 3 | 28 | 18 | 32 | 31 | 33 |
| 2 | 10 | 14 | 34 | 12 | 26 | 76 | 11 |
| 3 | 70 | 18 | 23 | 37 | 97 | 61 | 23 |
| 4 | 26 | 20 | 38 | 21 | 120 | | 6 |
| 5 | 24 | 13 | 52 | 32 | 116 | 19 | 6 |
| 6 | 37 | 12 | 6 | 63 | 38 | 10 | |
| 7 | 11 | 35 | 3 | 19 | 84 | 21 | 36 |
| 8 | 16 | 32 | 44 | 28 | 64 | 40 | 24 |
| 9 | 8 | 30 | 42 | | 74 | 48 | 93 |
| 10 | 15 | 23 | 60 | 9 | 40 | 65 | 36 |
| 11 | 16 | 71 | 56 | 40 | 84 | 44 | 96 |
| 12 | NS ¹ | 52 | 28 | 12 | 60 | 47 | |
| 13 | 6 | 53 | 10 | 38 | 38 | 64 | |
| 14 | 13 | 103 | 15 | 23 | NS ¹ | 55 | |
| 15 | 20 | 9 | 31 | 118 | 28 | 49 | |
| 16 | 20 | 62 | 85 | 66 | 73 | 23 | 57 |
| 17 | 36 | 44 | 110 | 287 | 109 | 45 | 29 |
| 18 | 33 | 117 | 132 | 212 | 98 | 41 | 14 |
| 19 | | 74 | 114 | 75 | 191 | 94 | 41 |
| 20 | | 74 | 70 | 26 | 115 | 100 | 15 |
| 21 | 16 | 18 | 157 | 87 | 88 | 100 | 54 |
| 22 | 28 | 80 | 150 | 148 | 92 | 62 | 62 |
| 23 | 74 | 39 | 231 | 178 | 314 | 58 | 82 |
| 24 | 69 | 131 | 75 | 295 | 134 | 145 | 120 |
| 25 | 28 | - | 48 | 110 | 6 | 127 | 25 |
| 26 | 32 | 31 | - | - | - | - | - |
| 27 | 50 | 4 | - | - | - | - | - |
| 28 | 79 | 13 | - | - | - | - | - |
| 29 | 42 | 18 | - | - | - | - | - |
| 30 | 41 | 20 | - | - | - | - | - |
| Total | 842 | 1213 | 1642 | 1954 | 2121 | 1425 | 863 |

¹ No sample

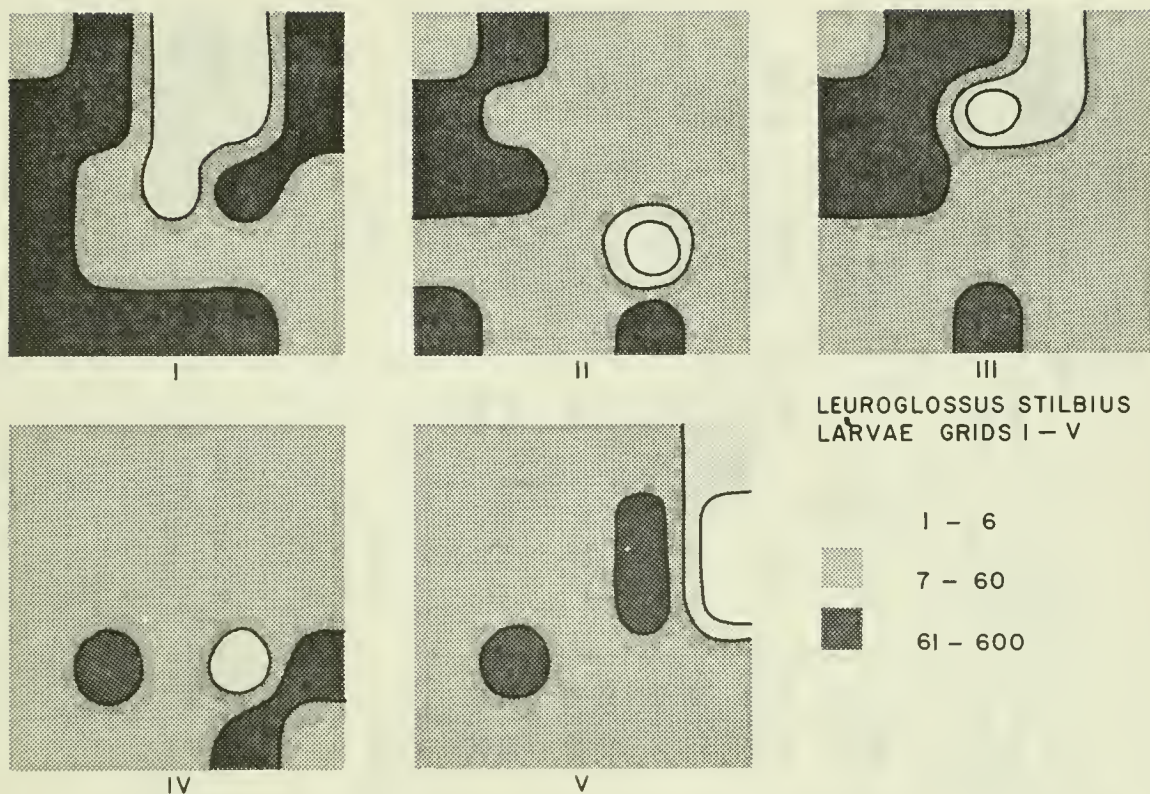


Figure 4. *Leuroglossus stilbius* larvae: distribution and relative abundance on Grids I - V, April 18-23, 1952.

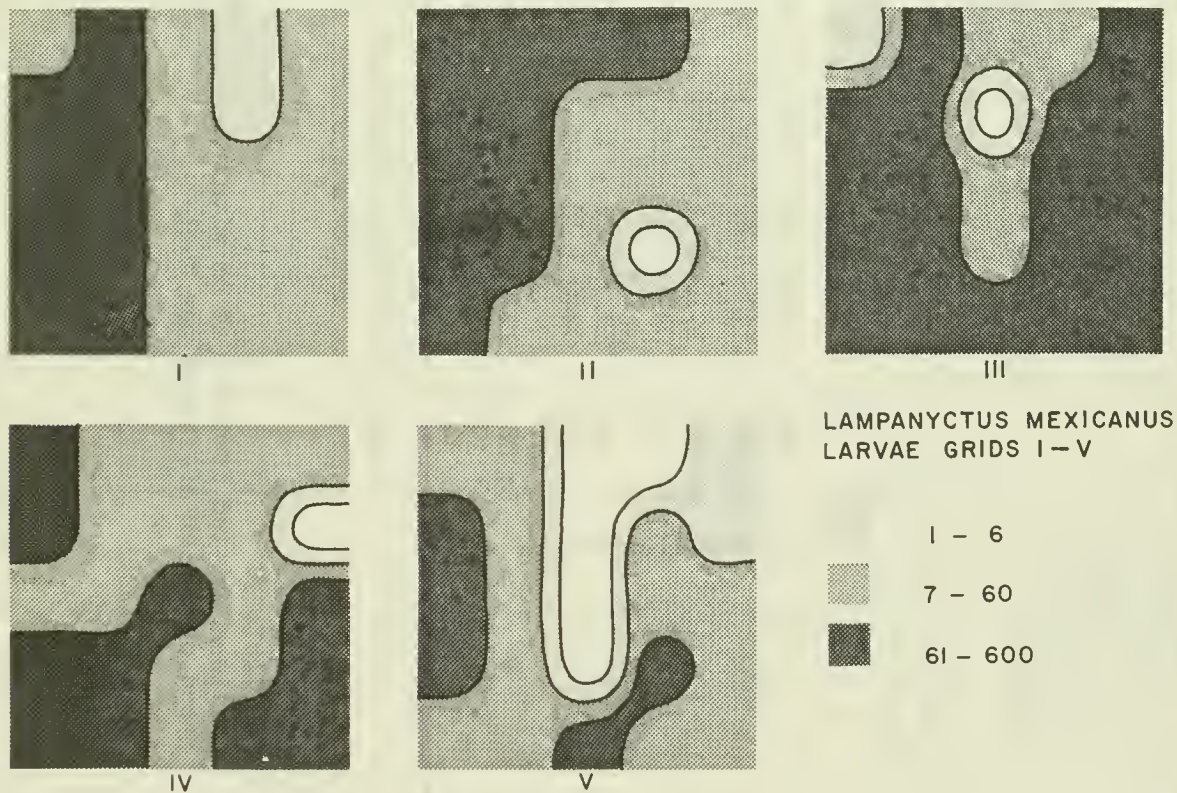


Figure 5. *Lampanyctus mexicanus* larvae: distribution and relative abundance on Grids I - V, April 18-23, 1952.

TABLE 12--Night (N) and day (D) collections of larvae of *Leuroglossus stilbius*¹ and *Lampanyctus mexicanus*² on grids I - V.

| Grid | Time | Stations ³ | <i>Leuroglossus stilbius</i> | | | <i>Lampanyctus mexicanus</i> | | |
|-------------------------------------------|----------------|-----------------------|------------------------------|-----------------|-----------------------------------|------------------------------|-----------------|-----------------------------------|
| | | | Total larvae | Number per haul | Grid ratio ⁴ Night/day | Total larvae | Number per haul | Grid ratio ⁴ Night/day |
| I | D: 0810 - 1740 | 1 - 15 | 691 | 46.07 | 1.91 | 470 | 31.23 | 3.87 |
| | N: 1905 - 0050 | 17 - 25 | 795 | 88.03 | | 1,087 | 120.78 | |
| II | D: 0810 - 1715 | 1 - 13 | 396 | 30.46 | 2.46 | 329 | 25.31 | 5.75 |
| | N: 1900 - 0240 | 15 - 25 | 823 | 74.81 | | 1,602 | 145.64 | |
| III | D: 0810 - 1710 | 1 - 13 | 397 | 30.54 | 2.04 | 873 | 67.15 | 1.69 |
| | N: 1845 - 0250 | 15 - 25 | 687 | 62.45 | | 1,248 | 113.45 | |
| IV | D: 0810 - 1735 | 1 - 13 | 389 | 29.92 | 1.51 | 526 | 40.46 | 1.90 |
| | N: 1915 - 0240 | 15 - 25 | 497 | 45.18 | | 844 | 76.73 | |
| V | D: 0810 - 1720 | 1 - 14 | 356 | 25.43 | 1.35 | 364 | 26.00 | 1.89 |
| | N: 1925 - 0100 | 17 - 25 | 310 | 34.44 | | 442 | 49.11 | |
| 5-day ratio of larvae per haul Night/Day: | | | | | 1.88 | 2.66 | | |

¹ See table 13

² See table 14

³ Stations omitted if taken at or within one-half hour before and after sunset

⁴ Based on number of larvae per haul

TABLE 13.--Night and day collections of *Leuroglossus stilibius* larvae on drogue and anchor stations¹

| Day | Drogue stations | | | | | | Anchor stations | | | | | |
|-------|--------------------------------------------------------------------|-----------------|-------------------------|-----------------|-----------------------------|-------------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|
| | Day hauls (D) | | | Night hauls (N) | | | Day hauls (D) | | | Night hauls (N) | | |
| | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul |
| 1 | 1 2 3 | 3 10 | 4.33 | 4 5 6 | 15 12 37 | | 1 2 3 | 35 35 20 | | 4 5 6 | 38 58 25 | |
| 2 | 7 8 9 | 22 16 5 | | 10 11 12 | 18 16 NS ³ | 4.93 | 7 8 9 | 27 26 41 | 30.00 | 10 11 12 | 26 54 77 | 1.34 |
| 3 | 13 14 15 | 10 16 6 | 14.33 | 16 17 18 | 42 43 53 | 1.19 | 13 14 15 | 6 34 3 | 31.33 | 16 17 18 | 46 44 39 | 1.67 |
| 4 | 19 20 21 | | 10.67 | 22 23 24 | 25 13 22 | 4.31 | 19 20 21 | 17 23 12 | 14.33 | 22 23 24 | 85 39 42 | 3.00 |
| 5 | 25 26 27 | 14 13 44 | 15.67 | 28 29 30 | 103 30 41 | 1.28 | 25 26 27 | 11 19 4 | 17.33 | 28 29 30 | 38 40 45 | 3.19 |
| Total | | 206 | 23.33 | | 470 | 2.49 | | 313 | 11.33 | | 606 | 41.00 |
| | 5-day ratio of larvae per haul N/D: Drogue - 2.38 Anchor - 2.22 | | | | | | | | | | | |

¹ See table 12² Larvae per haul³ NS - No sample

TABLE 14.--Night and day collections of *Lampanyctus mexicanus* larvae on drogue and anchor stations¹

| Day | Drogue stations | | | | | | Anchor stations | | | | | |
|-------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|
| | Day hauls (D) | | | Night hauls (N) | | | Day hauls (D) | | | Night hauls (N) | | |
| | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul | Station | Number per haul | Average number per haul |
| 1 | 1 | 22 | | 4 | 26 | | 1 | 3 | | 4 | 20 | |
| | 2 | 10 | | 5 | 24 | | 2 | 14 | | 5 | 13 | |
| | 3 | 70 | | 6 | 37 | | 3 | 18 | | 6 | 12 | |
| 2 | 7 | 11 | 34.00 | 10 | 15 | | 7 | 35 | 11.67 | 10 | 23 | 15.00 |
| | 8 | 16 | | 11 | 16 | | 8 | 32 | | 11 | 71 | |
| | 9 | 8 | | 12 | NS ³ | | 9 | 30 | | 12 | 52 | 1.29 |
| 3 | 13 | 6 | 11.67 | 16 | 20 | 15.50 | 13 | 53 | 32.33 | 16 | 62 | 48.67 |
| | 14 | 13 | | 17 | 36 | | 14 | 103 | | 17 | 44 | |
| | 15 | 20 | | 18 | 33 | | 15 | 9 | | 18 | 117 | 1.51 |
| 4 | 19 | | 13.00 | 22 | 28 | 29.67 | 19 | 74 | 55.00 | 22 | 80 | 74.33 |
| | 20 | | | 23 | 74 | | 20 | 74 | | 23 | 39 | 1.35 |
| | 21 | 16 | | 24 | 69 | | 21 | 18 | | 24 | 131 | |
| 5 | 25 | 28 | 5.33 | 28 | 79 | 57.00 | 25 | | 55.33 | 28 | 13 | 83.33 |
| | 26 | 32 | | 29 | 42 | | 26 | 31 | | 29 | 18 | 1.51 |
| | 27 | 50 | | 30 | 41 | | 27 | 4 | | 30 | 20 | |
| Total | | 302 | 37.67 | | 540 | 54.00 | | 498 | 11.66 | | 715 | 17.00 |
| | | | | | | | | | | | | 1.46 |

5-day ratio of larvae per haul N/D: Drogue - 1.82
Anchor - 1.44

¹ See table 12

² Based on average number per haul

³ NS - No sample

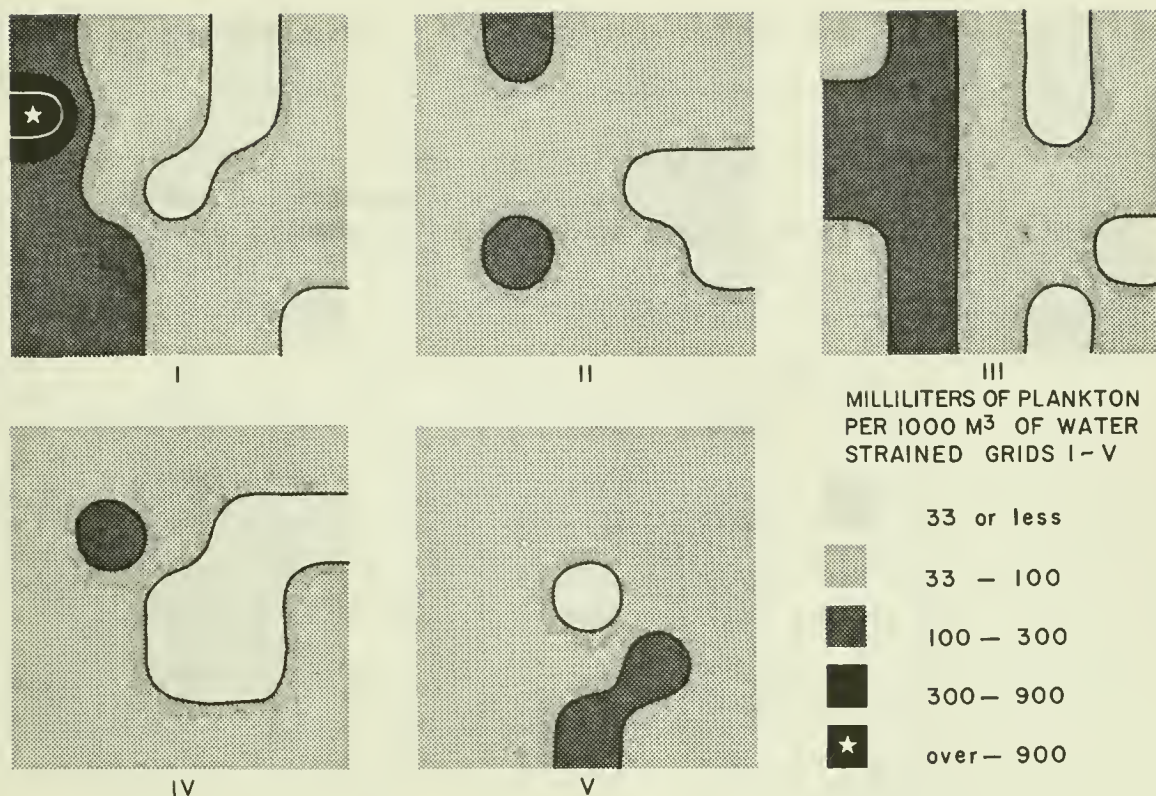


Figure 6. Plankton volumes: relative concentrations on Grids I-V, April 18-23, 1952.

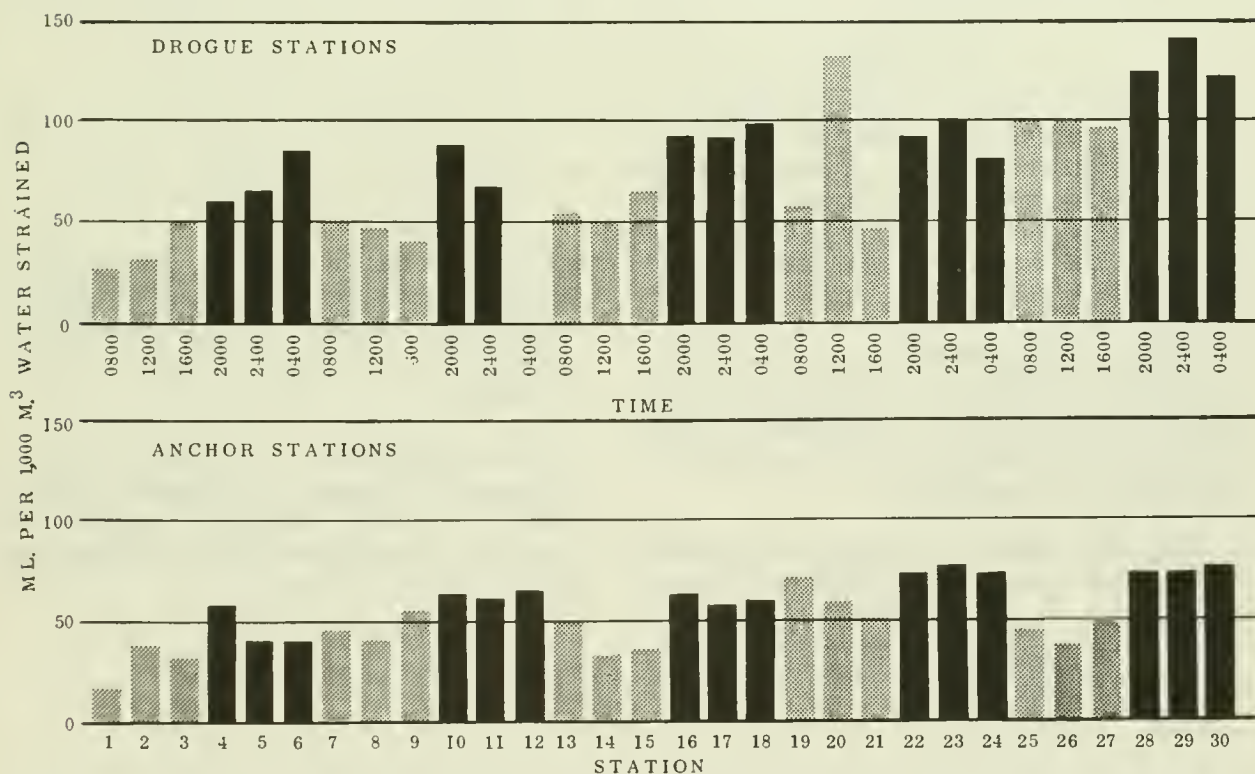


Figure 7. Plankton volumes (ml./1,000 m.³ water strained) on drogue and anchor stations, April 18-23, 1952. Times are idealized to the 4-hour intervals discussed in the text. (See table 1 for actual times).

TABLE 15.--Night (N) and day (D) collections of plankton volumes¹ on Grids I-V.

| Grid | Time | Stations ² | Cumulative Plankton volumes | Plankton volume per haul | Daily Ratio ² |
|------|----------------|-----------------------|-----------------------------|--------------------------|--------------------------|
| I | D: 0810 - 0740 | 1 - 15 | ml. 696 | ml. 46.40 | N/D 5.34 |
| | N: 1905 - 0050 | 17 - 25 | 2,209 | 245.44 | |
| II | D: 0810 - 1715 | 1 - 13 | 590 | 45.38 | 1.87 |
| | N: 1900 - 0240 | 15 - 25 | 935 | 85.00 | |
| III | D: 0810 - 1710 | 1 - 13 | 662 | 50.92 | 2.12 |
| | N: 1845 - 0250 | 15 - 25 | 1,186 | 107.82 | |
| IV | D: 0810 - 1735 | 1 - 13 | 480 | 36.92 | 2.30 |
| | N: 1915 - 0240 | 15 - 25 | 935 | 85.00 | |
| V | D: 0810 - 1720 | 1 - 14 | 1,038 | 74.14 | 1.09 |
| | N: 1925 - 0100 | 17 - 25 | 730 | 81.11 | |

5-day ratio ml. per haul N/D: 2.38

¹ Small organisms only (see table 1)

² Stations omitted if taken at or one-half hour before or after sunset

³ Based on plankton volume per haul

volumes, and these were near the center of the grid.

Ratios of night and day hauls were determined for the plankton volumes by dividing the grid stations in the same manner as was done for the larvae of *Leuroglossus stilbius* and *Lampanyctus mexicanus*.

The 5-day ratios of volumes on the grids showed 2.38 times as much plankton collected

at night as in the day (table 15), while the same ratios on the drogue and anchor stations respectively showed 1.47 and 1.46 times as much plankton collected at night as in the day (table 16).

The histograms for the drogue and anchor stations (fig. 7) show the changes in volume caused by diurnal migration; generally increasing to a maximum at night and decreasing to a minimum in the day.

Table 16.--Night and day collections of plankton volumes on drogue and anchor stations¹

| Day | Drogue stations | | | | | | Anchor stations | | | | | |
|-------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|-------------------------|
| | Day hauls (D) | | | Night hauls (N) | | | Day hauls (D) | | | Night hauls (N) | | |
| | Station | Volume per haul | Average volume per haul | Station | Volume per haul | Average volume per haul | Station | Volume per haul | Average volume per haul | Station | Volume per haul | Average volume per haul |
| 1 | 1 | ml. 26 | ml. 34.67 | 4 | ml. 60 | N/D | 1 | ml. 17 | ml. 29.67 | 4 | ml. 58 | ml. 46.33 |
| | 2 | 30 | | 5 | 67 | | 2 | 40 | | 5 | 41 | |
| | 3 | 48 | | 6 | 84 | | 3 | 32 | | 6 | 40 | |
| 2 | 7 | 49 | 34.67 | 10 | 88 | 2.03 | 7 | 45 | 29.67 | 10 | 61 | 46.33 |
| | 8 | 47 | | 11 | 67 | | 8 | 42 | | 11 | 61 | |
| | 9 | 42 | | 12 | NS ³ | | 9 | 56 | | 12 | 66 | |
| 3 | 13 | 52 | 46.00 | 16 | 88 | 1.68 | 13 | 47 | 47.66 | 16 | 64 | 62.67 |
| | 14 | 50 | | 17 | 90 | | 14 | 33 | | 17 | 56 | |
| | 15 | 63 | | 18 | 98 | | 15 | 37 | | 18 | 60 | |
| 4 | 19 | 59 | 55.00 | 22 | 90 | 1.67 | 19 | 70 | 39.00 | 22 | 74 | 60.00 |
| | 20 | 130 | | 23 | 99 | | 20 | 58 | | 23 | 77 | |
| | 21 | 46 | | 24 | 84 | | 21 | 42 | | 24 | 72 | |
| 5 | 25 | 99 | 78.33 | 28 | 127 | 1.16 | 25 | 45 | 56.67 | 28 | 72 | 74.33 |
| | 26 | 99 | | 29 | 139 | | 26 | 39 | | 29 | 72 | |
| | 27 | 96 | | 30 | 117 | | 27 | 48 | | 30 | 74 | |
| Total | | 936 | 98.00 | | 1,298 | 1.30 | | 651 | 44.00 | | 948 | 72.67 |
| | | | | | | | | | | | | 1.65 |

5-day ratio ml. per haul N/D:Drogue - 1.47
Anchor - 1.46

¹ Small organisms only (see table 1).

² Based on plankton volume per haul.

³ NS - No sample.

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